

| SCSA5102 | DATABASE TECHNOLOGIES | L | T | P | Credits | Total Marks |
|----------|-----------------------|---|---|---|---------|-------------|
|          |                       | 3 | 0 | 0 | 3       | 100         |

### COURSE OBJECTIVES

- To give students in depth information about system implementation techniques, data storage, representing data elements, database system architecture.
- Demonstrate principles of design, development and administration relevant to Oracle database technology.
- Formulate a working definition of database development and administration.
- To understand the emerging databases like Mobile, Multimedia, Cloud and Big Data and Hadoop infrastructures.

### UNIT 1 INTRODUCTION

9 Hrs.

Data base system Architecture – Query Optimization Techniques - Transaction Management: Transaction Processing Concepts - Concurrency Control - Recovery Techniques -Database Security.

### UNIT 2 PARALLEL DBMS

9 Hrs.

Architecture-Query evaluation-Query optimization-parallelizing Individual operations. Distributed DBMS: Architecture-storing data-Cataloguing-Query processing-Transactions Concurrency and Recovery.

### UNIT 3 MOBILE DATABASES

9 Hrs.

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control - Transaction Commit Protocols

### UNIT 4 OBJECT AND MULTIMEDIA DATABASE SYSTEMS

9 Hrs.

Object Databases–Advantages and disadvantages compared to Relational Databases- Abstract data types, Objects identity and reference types- Inheritance Database design for ORDBMS ODMG data model and ODL OQL.MULTIMEDIA DATABASES: Nature of Multimedia data and applications Data management issues– Components of Multimedia database management system.

### UNIT 5 BIGDATA AND HADOOP

9 Hrs.

Big Data–Introduction-Technologies–Reference Architecture- Hadoop– Introduction to Hadoop Distributed File System–Design of HDFS–HDFS Concepts–Interfaces for Hadoop File System–Map Reduce–weather Dataset–Analyzing the data with Hadoop–Anatomy of Map Reduce Job Run.

Max. 45 Hrs.

### TEXT / REFERENCE BOOKS

1. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", 3<sup>rd</sup> Edition McGraw Hill Publications.
2. Korth.H.F. and A.Silberschatz, "Data base system concepts", 3<sup>rd</sup> Edition, McGraw Hill Publications.
3. Ramez Elmasri and B.Navathe:"Fundamentals of Database Systems", 5<sup>th</sup> Ed., Addison Wesley, 2008.
4. Stenfnno Ceri and Gieusppepelagatti, "Distributed database-principles and systems", 3<sup>rd</sup> Edition.
5. O'Reilly, "Hadoop–The Definitive Guide", O'Reilly Media.
6. <http://www.oracle.com/technetwork/topics/entarch/articles/info-mgmt-big-data-ref-arch-1902853.pdf>
7. <http://www.comptechdoc.org/independent/database/basicdb/dataobject.html>.

### END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 6 Questions of 5 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

|          |                                        |   |   |   |         |             |
|----------|----------------------------------------|---|---|---|---------|-------------|
| SCSA5103 | SOFTWARE QUALITY ASSURANCE AND TESTING | L | T | P | Credits | Total Marks |
|          |                                        | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

- To introduce the basics and necessity of software testing.
- To introduce various testing techniques along with software production.
- To introduce the concepts of Software quality and its assurance.

### UNIT 1 INTRODUCTION

9 Hrs.

Software testing fundamentals-objectives-principles-Testability-Levels of testing-TMM- Characteristics of a tester-A testing group- Comparison of KPA in ISO,CMM and TMM-Software quality attributes.

### UNIT 2 SOFTWARE TESTING METHODS AND STRATEGIES

9 Hrs.

Test case design-White box testing- Basic path testing-Flow Graph Notation-Cyclomatic Complexity-Deriving Test Cases-Graphic matrices-Control Structure Testing-Deriving Test cases-Dataflow Testing-Loop Testing-Black box Testing-Graph Based Testing Methods-Equivalence partitioning-Boundary value analysis-Comparison testing. Strategic Approach to Software Testing-Verification and Validation-Strategic issues-Unit testing-Consideration Procedures. Integration Testing-Regression Testing- Integration Test Documentation-Validation testing-Configuration Review-Alpha and Beta Testing System Testing-Art of Debugging. Case studies: Writing test cases for white box and black box testing.

### UNIT 3 OBJECT ORIENTED TESTING, METRICS AND MEASUREMENTS

9 Hrs.

Testing OOD Models-OO Testing Strategies-Test Case Design for OO Software-Testing Methods applicable at the class level-Inter class test design-The intent of OO metrics-Distinguishing characteristics of OO metrics. Common software measurements: Code coverage-Cohesion-Comment density, Coupling-Function point analysis- Number of classes and interfaces-Number of lines of customer requirements-Robert Cecil Martin's software package metrics-Bugs per line of code-Source lines of code.

### UNIT 4 QUALITY CONSIDERATIONS

9 Hrs.

Planning for quality – Quality plan – Cost/benefit tradeoff – Feature/bug tradeoff – Modeling quality improvement-Notation of defects-Defects-Defect removal activities-Conditions for each activity-Defect removal goals-Quality improvement teams-quality recognition- Manage Priorities Effectively-Statistical Quality Assurance-Software Reliability.

### UNIT 5 OVERVIEW OF STANDARDS

9 Hrs.

Levels of standards-Quality assurance standards-Project management standards-Dependability standards-Product standards-Process standards-ISO9000-Reviews,Audits and Certification.

Max. 45 Hrs.

## TEXT / REFERENCE BOOKS

1. Ilene Barnstein,"Practical Software Testing-A Process Oriented Approach", Springer International Edition.
2. Humphrey, W.S. (2002), "A Discipline for Software Engineering. Reading, MA", Addison-Wesley.
3. Roger S.Pressman, "Software Engineering, A Practitioner's Approach", Tata McGraw Hill, 5<sup>th</sup> Edition.
4. Marc Roper, "Software Testing", McGraw Hill Professional, 1994.
5. Ian Sommerville, "Software Engineering", Addison-Wesley, 5<sup>th</sup> Edition, 1996.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 6 Questions of 5 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

| SCSA5104 | NETWORK TECHNOLOGIES AND PROTOCOLS | L | T | P | Credits | Total Marks |
|----------|------------------------------------|---|---|---|---------|-------------|
|          |                                    | 3 | 0 | 0 | 3       | 100         |

## COURSE OBJECTIVES

- To understand how routing is done in telephone networks.
- To learn about the different internet routing protocols.
- To appreciate the different aspects routing in optical and mobile networks.
- To understand the issues in adhoc networks, the protocols used for the working of adhoc networks.

### UNIT 1 INTRODUCTION

9 Hrs.

ISO OSI Layer Architecture-TCP/IP Layer Architecture – Functions of Network layer-General Classification of routing- Routing in telephone networks-DynamicNon Hierarchical Routing(DNHR)-Trunk status map routing (TSMR)-Real-time network routing(RTNR)-Distance vector routing-Link state routing-Hierarchical routing.

### UNIT 2 WIRED LINE AND WIRELESS NETWORKS

9 Hrs.

LAN IEEE802 Projects-Ethernet-Token Ring-FDDI-MAN-DQDB-SMDS-Wireless LAN-IEEE 802.11-WiFi-SONET- DWDM-DSL-Switching-Circuit Switching-Packet switching Intelligent Networks-LAN bridges.

### UNIT 3 INTERNET ROUTING PROTOCOLS

9 Hrs.

Interior routing protocols: Routing Information Protocol (RIP) - Open Shortest Path First (OSPF) – Exterior Routing protocols: Exterior Gateway Protocol(EGP) and Border Gateway Protocol(BGP).Multicast routing :Pros and cons of Multicast and Multiple Unicast Routing - Distance Vector Multicast Routing Protocol (DVMRP) - Multicast Open Shortest Path First(MOSPF) MBONE.

### UNIT 4 ADVANCED NETWORKS CONCEPTS

9 Hrs.

VPN-Remote-Access VPN-site-to-site VPN-Tunneling to PPP-Security in VPN-MPLS-Operation– Routing - Tunneling and Use of FEC - Traffic Engineering and MPLS based VPN - Overlay Networks - P2P Connections - IPv4 vsIPv6.

### UNIT 5 TELE COMMUNICATION AND CELLULAR NETWORKS

9 Hrs.

Telecommunication systems-GSM-Services-Architecture-Protocols-Handover-DECT-Architecture-Protocols-Handovers- TETRA-Bluetooth Technology-GPRS-WAP-WAP Architecture-WAP Protocols- WLL.

Max. 45 Hrs.

## TEXT / REFERENCE BOOKS

1. William Stallings, "High-Speed Networks and Internets, Performance and Quality of Service", 2<sup>nd</sup> Edition, Pearson Education Asia, Reprint India, 2002.
2. Martha Steens trup, "Routing in Communication Networks", Prentice Hall International, New York, 1995.
3. Leon Garcia.Widjaja,"Communication Networks", Tata McGraw-Hill, 6<sup>th</sup> Edition, 2002.
4. Aunurag Kumar, D.Manjunath, Joy Kuri, "Communication Networking", Morgan Kaufmann Publishers, 2011.
5. Jochen Schiller, "Mobile Communications", 2<sup>nd</sup> Edition, Pearson Education, 2008.
6. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", 2<sup>nd</sup> Edition, Tata McGraw Hill, 2010.

## END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 6 Questions of 5 Marks each – No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 Marks

70 Marks

| SCS5105 | DISTRIBUTED DATABASE SYSTEMS | L | T | P | Credits | Total Marks |
|---------|------------------------------|---|---|---|---------|-------------|
|         |                              | 3 | 1 | 0 | 4       | 100         |

## COURSE OBJECTIVES

- To provide an introduction to different kinds of databases.
- In particular, it covers parallelism, synchronization and concurrency control.

### UNIT1 PARALLEL AND DISTRIBUTED DATABASES

12Hrs.

Database System Architectures: Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism—Inter and Intra Query Parallelism and Intra operation Parallelism– Design of Parallel Systems- Distributed Database Concepts- Distributed Data Storage– Distributed Transactions– Commit Protocols– Concurrency Control– Distributed Query Processing.

### UNIT2 OBJECT AND OBJECT RELATIONAL DATABASES

12Hrs.

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations– Methods– Persistence– Type and Class Hierarchies– Inheritance– Complex Objects– Object Database Standards, Languages and Design: ODMG Model– ODL– OQL– Object Relational and Extended– Relational Systems : Object Relational features in SQL/Oracle.

### UNIT3 XML AND WEB DATABASES

12Hrs.

XML Databases: XML-Related Technologies- XML Schema- XML Query Languages- Storing XML in Databases- SQL- Native XML Databases- Web Databases- Information Retrieval System

### UNIT4 ADVANCED DATA MODELS

12Hrs.

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Multimedia Databases - Data Warehousing- Data Mining.

### UNIT5 EMERGING TECHNOLOGIES

12Hrs.

Geographic Information Systems- Biological Data Management- Introduction to Big Data- Evolution of Big data– Best Practices for Big data Analytics- Big data characteristics- Volume, Veracity, Velocity, Variety- Data Appliance and Integration tools– Green plum– Informatica.

Max. 60 Hours

## COURSE OUTCOMES

On completion of the course, student will be able to

- CO1 - Distinguish between parallel and concurrency control query processing.
- CO2 - Produce the transaction management and query processing techniques in object relational databases. CO3- Develop a XML database and web database to optimize database performance in practice.
- CO4 - Design the mobile database and Multimedia database.
- CO5 - Analyse, Design and present the biological data management.
- CO6 - Design Big Data for decision support system and tools for Business operations.

## TEXT / REFERENCES BOOKS

1. R.Elmasri, S.B.Navathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S.Sudharshan, "Database System Concepts", 5th Edition, McGraw Hill, 2006.
4. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Third Edition 2004.
5. Vijay Kumar, "Mobile Database Systems", John Wiley & Sons, 2006.
6. Frank J Orlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series 2012

| SCS5107 | COMPUTATIONAL INTELLIGENCE | L | T | P | Credits | Total Marks |
|---------|----------------------------|---|---|---|---------|-------------|
|         |                            | 3 | 1 | 0 | 4       | 100         |

## COURSE OBJECTIVES

- To understand the concepts ,paradigms,algorithms,andimplementationofClanditsconstituentmethodologies
- To emphasize on practical applications throughout,that is,howtoapplytheconcepts,paradigms,algorithms,and implementationsdiscussedtopracticalproblemsinengineeringandcomputerscience.
- TointroducethebasictoolsandtechniquesinComputationalIntelligencesuchasNeuralNetworksandGenetic Algorithms from an application perspective to the students.

### UNIT1 ARTIFICIALNEURALNETWORKS

12Hrs.

The Artificial Neuron - Supervised Learning Neural Networks-Supervised Learning rules -Unsupervised LearningNeuralNetworks-ReinforcementLearning–Learningthroughawards-ModelfreeReinforcementLearning– Performance Measures-Performance Factors.

### UNIT2 EVOLUTIONARY COMPUTATION

12Hrs.

IntroductiontoEvolutionaryComputation-GeneticAlgorithms-GeneticProgramming–BasicEvolutionary Programming–GenericEvolutionStrategyAlgorithm–BasicDifferentialEvolution–BasicCulturalAlgorithm-Belief Space–Coevolution-Applicationsofvariousrevolutionarycomputationtechniques.

### UNIT3 SWARMINTELLIGENCE

12Hrs.

BasicParticleSwarmOptimization–SocialNetworkStructures-BasicVariations-BasicPSOParameters-Ant ColonyOptimization–AntAlgorithms-SimpleAntColonyOptimizationAlgorithm-AntSystem–AntColonySystem- Max- Min Ant System-Basic Artificial Bee Colony Algorithm.

### UNIT4 ARTIFICIAL IMMUNE SYSTEMS

12Hrs.

NaturalImmuneSystem-LearningtheAntigenStructure-ArtificialImmuneSystemAlgorithm-ClassicalView Models-Clonal Selection Theory Models-Network Theory Models-Artificial Immune Network-Adapted artificial Immune Network.

### UNIT5 FUZZY SYSTEMS

12Hrs.

FuzzySets-FuzzyLogicandReasoning-FuzzyInferencing-FuzzyControllers-MamdaniFuzzyController-Takagi- Sugeno Controller–Introduction to Rough sets.

Max. 60 Hours

## COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand the artificial neural network and Select appropriately from a range of techniques when implementing intelligent systems

CO2 - Analyze genetic algorithm and applications of various evolutionary computation techniques.

CO3 - Define the concept of swarm Intelligence.

CO4 - Have practical exposure to the concepts of Distributed file system and its implementation.

CO5 - Create, design and construct the artificial immune system and network.

CO6 - Apply CI techniques to real-world problems to develop intelligent systems

## TEXT / REFERENCE BOOKS

1. AndriesPEngelbrecht,"ComputationalIntelligence",WileyPublications–SecondEdition
2. LeszekRutkowski,"ComputationalIntelligenceMethodsandTechniques"–Springer2008
3. LakhmiC.Jain,"ComputationalIntelligenceParadigmsInnovativeApplications"-Springer2008

|                |                                  |          |          |          |                |                    |
|----------------|----------------------------------|----------|----------|----------|----------------|--------------------|
| <b>SCS6533</b> | <b>WEB TECHNOLOGY LABORATORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>Credits</b> | <b>Total Marks</b> |
|                |                                  | <b>0</b> | <b>0</b> | <b>6</b> | <b>3</b>       | <b>100</b>         |

## SUGGESTED LIST OF EXPERIMENTS

### HTML

- Create a personalized web page using HTML. The web page must include links about yourself, your curriculum vitae (forms), album (img tags), tutorials and contacts. All types of hyper-link should be used.
- Create a web page using frames, ordered and unordered list.

### XML

- Develop a simple application using XML

### JAVA SCRIPT

- Perform client side validation for an e-mail registration form using JavaScript.
- Create a simple quiz application with timer using JavaScript.
- Develop an application to fetch information from a database with AJAX

### JAVA – APPLET

- Create an applet application and load an image in the applet.
- Create a Java application to show how mouse events are handled.

### ASP

- Develop a simple application using ASP

### PHP

- Develop a simple application using PHP

### WEB APPLICATIONS

- Creating a simple web service using SOAP, Cloud service, Parallelization.

### COURSE OUTCOMES:

CO1: Students are able to develop a dynamic webpage by the use of java script and DHTML.

CO2: Students will be able to write a well formed / valid XML document.

CO3: Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.

CO4: Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.

CO5: Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

CO6: Student will be able to write PHP and Web Applications.

| SCSA6301 | INTERNET OF THINGS LAB | L | T | P | Credits | Total Marks |
|----------|------------------------|---|---|---|---------|-------------|
|          |                        | 0 | 0 | 4 | 2       | 100         |

## COURSE OBJECTIVES

- To identify the different technologies and different platforms in IoT
- To understand how to use sensors and actuators for design of IoT.
- To learn different protocols used in IOT.
- To learn the concepts of smart city development in IOT.
- To learn how to analysis the data in IOT.

## SUGGESTED LIST OF EXPERIMENTS

1. Monitor the soil moisture level using Raspberry pi.
2. Monitor the surrounding air's quality using Arduino & sensors connected to a Raspberry Pi.
3. Implement Raspberry Pi as a local server by installing Apache, PHP, and MySQL.
4. Interface PIR sensor with ESP8266 WiFi module on NodeMCU platform.
5. Posting temperature and humidity of the environment to Thing speak cloud service using NodeMCU.
6. Implement Raspberry Pi Temperature System with Ubidots cloud
7. Implement smart cities Sensor Board v3.0 using Wasp mote platform for measuring temperature, humidity and pressure.
8. Measure light intensity and pollution level using Wasp mote platform.
9. Receiving and storing data in Meslium gateway for Wasp mote platform.
10. Implement barometric pressure monitoring using BMP280 sensor for Zolertia module.

**PART B:** 2 Questions from each unit of internal choice, each carrying 10 marks

**5**

**0 Marks**

| SCS5101 | ADVANCED OPTIMIZATION TECHNIQUES | L | T | P | Credits | Total Marks |
|---------|----------------------------------|---|---|---|---------|-------------|
|         |                                  | 3 | 1 | 0 | 4       | 100         |

**COURSE OBJECTIVES**

- To learn linear and nonlinear programming problem.
- To understand the concept of queuing model, simulation and decision theory.

**UNIT1 INTRODUCTION TO OPTIMIZATION****12Hrs.**

Formulation of optimization problem- Simplex Method - Big M Method - Two phase method - Dual Simplex method-Integer Programming-Gomory All Integer cutting plane Method-Gomory Mixed Integer Method-Branch and Bound Method

**UNIT2 NONLINEAR PROGRAMMING****12Hrs.**

Introduction-Unconstrained and Constrained Optimization-Kuhn Tucker conditions-Relative Maximum and Minimum values- Method of Lagrangian Multipliers- Hessian Matrix- Quadratic programming- Wolfe's Modified Simplex Method -Problems

**UNIT3 DYNAMIC PROGRAMMING****12Hrs.**

Recursive relationship-Solution to recursive equation-Dynamic Programming Algorithm-Principle of Optimality-Maximum and minimum values-Solution of LPP by Dynamic Programming-Multistage problem

**UNIT4 QUEUEING NETWORKS****12Hrs.**

Introduction to Concept of Queueing Models-Single Server-Multiple server Models-Problems-pollaczek Khinchin theorem.Theoretical concepts of Open queueing networks(Theory)-closed Queueing Networks(Theory)-Queues in series(Theory).

**UNIT5 DECISION ANALYSIS & SIMULATION****12Hrs.**

Introduction to Decision Making process-Elements-Decision making under uncertainty-Maximin and Maximax criteria-Hurwicz criterion-Laplace criterion-Minimax Regret criterion-Decision tree analysis-Problems - Simulation-Nature and need for simulation-Monte Carlo method-Application to Queueing systems.

**Max.60Hours****COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Determine the optimization of the formulation method for a given problem.
- CO2 - Identify the second order derivatives us nonlinear algebra.
- CO3 - Analyze the best possible on dynamic programming.
- CO4 - Implement the Queueing networks to develop and for solving various types of optimization problems.
- CO5 - Interpret the fundamental needs of algorithms in decision analysis & simulation.
- CO6 - Describe the various optimization techniques and its real time applications.

**TEXT / REFERENCE BOOKS**

1. J.K.Sharma, "Operations Research Theory and Applications", Fourth Edition, Macmillan India Ltd., 2010.
2. F.S.Hillier & G.J.Lieberman, "Introduction to Mathematical programming", McGraw-Hill International Edition.
3. H.A.Taha- "Operations Research: An Introduction", 6th Edition, Macmillan.
4. Prem Kumar Gupta and D.S.Hira, "Operations research", S Chand, 2000.
5. Sharma.S.D, "Operations Research", Kedarnath Ramnath & Co, 2002
6. Gupta.P.K and Man Mohan "Problems in Operations Research", Sultan Chand and Sons, 7th Edition, 1995

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks:80****Exam Duration:3Hrs.****PART A:** 6 Questions of 5 marks each without choice uniformly distributed**30 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 10 marks**50 Marks**

| SCS5102 | ADVANCED DATA STRUCTURES AND ALGORITHMS | L | T | P | Credits | Total Marks |
|---------|-----------------------------------------|---|---|---|---------|-------------|
|         |                                         | 3 | 1 | 0 | 4       | 100         |

**COURSE OBJECTIVES**

- Be able to understand and analyze some fundamental data structures, such as binary search trees, disjoint sets, and self-adjusting lists
- Understand the implementation and complexity analysis of fundamental algorithms such as RSA, primality testing, max flow, discrete Fourier transform
- Will be exposed to algorithmic issues in a variety of areas, including linear programming and game-theory

**UNIT 1 INTRODUCTION TO ALGORITHMS****12 Hrs.**

Role of Algorithms in computing- Analyzing algorithm- Designing algorithm- Asymptotic Notations- Summations -Formulas and properties- Recurrences.

SORTING TECHNIQUES: Heapsort – Quicksort-Radix sort- Bucket sort- Analysis of sorting algorithms.

**UNIT 2 TREE STRUCTURES****12 Hrs.**

Binary Search Trees- AVL Trees- Red-Black Trees- B-Trees-Splay Trees.

HEAP STRUCTURES: Min/Max heaps- Leftist Heaps- Binomial Heaps- Fibonacci Heaps.

**UNIT 3 MULTIMEDIA STRUCTURES****12 Hrs.**

Segment Trees- k-d-Trees-Point Quad Trees-MX-Quad Trees-R-Trees-TV-Trees.

**UNIT 4 PROBLEM SOLVING TECHNIQUES****12 Hrs.**

Branch&Bound-NP hard and NP complete problems-Huffman Coding-Activity Networks-Flow Shop

Scheduling -Randomized Algorithms. ALGORITHMS: Greedy Algorithms - Back tracking -Dynamic programming - Divide and Conquer

**UNIT 5 GRAPH ALGORITHMS****12 Hrs.**

Graph Representation – BFS – DFS – Topological Sort – Connected Components – Minimum Spanning trees – Kruskal's Algorithm - Prim's Algorithm – Dijkstra's Algorithm – Floyd's Algorithm – Bellman Ford Algorithm

**Max. 60 Hours****COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Design and implement the various sorting algorithm and perform the intended operations.  
 CO2 - Understand the strength of balancing the height of the trees.  
 CO3 - Analyze an appropriate data structure for a multimedia structure.  
 CO4 - Apply the appropriate data structures in problem solving techniques .  
 CO5 - Design the algorithms to find the shortest path & to connect the nodes with minimum cost.  
 CO6 - Describe the appropriate data structure in context of solution of given problem.

**TEXT / REFERENCE BOOKS**

1. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, "Introduction to Algorithms", PHI, 2002.
2. Sara Baase, Allen R. Gelder, "Computer Algorithms and Introduction to Design and Analysis", Pearson, 2000.
3. Sahni, "Data Structures algorithm and application in C++", PHI, 2000
4. Mark Allen Weiss, "Data Structures and Algorithms in C++" Addison Wesley, 3rd Edition.
5. Aho A.V., Hopcroft J.E. and Ullman J.D., "Design and analysis of Computer algorithms".

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 80****Exam Duration : 3 Hrs.**

**PART A :** 6 Questions of 5 marks each without choice uniformly distributed

**30 Marks**

**PART B:** 2 Questions from each unit of internal choice, each carrying 10 marks

**50 Marks**

| SCS5103 | NETWORK ARCHITECTURE AND PROTOCOLS | L | T | P | Credits | Total Marks |
|---------|------------------------------------|---|---|---|---------|-------------|
|         |                                    | 3 | 1 | 0 | 4       | 100         |

**COURSE OBJECTIVES**

- To understand how routing is done in telephone networks
- To learn about the different internet routing protocols
- To appreciate the different aspects of routing in optical and mobile networks
- To understand the issues in ad hoc networks and the protocols used for the working of ad hoc networks

**UNIT1 INTRODUCTION****12Hrs.**

ISO OSI Layer Architecture - TCP/IP Layer Architecture - Functions of Network layer - General Classification of routing - Routing in telephone networks - Dynamic Non-Hierarchical Routing (DNHR) - Trunk status map routing (TSMR) - Real-time network routing (RTNR) - Distance vector routing - Link state routing - Hierarchical routing.

**UNIT2 WIRED LINE AND WIRELESS NETWORKS****12Hrs.**

LAN IEEE 802 Projects - Ethernet - Token Ring - FDDI - MAN - DQDB - SMDS - Wireless LAN - IEEE 802.11 - WiFi - SONET - DWDM - DSL - Switching - Circuit Switching - Packet switching - Intelligent Networks - LAN bridges.

**UNIT3 INTERNET ROUTING PROTOCOLS****12Hrs.**

Interior routing protocols: Routing Information Protocol (RIP) - Open Shortest Path First (OSPF) - Exterior Routing Protocols: Exterior Gateway Protocol (EGP) and Border Gateway Protocol (BGP). Multicast routing: Pros and cons of Multicast and Multiple Unicast Routing - Distance Vector Multicast Routing Protocol (DVMRP) - Multicast Open Shortest Path First (MOSPF) - MBONE.

**UNIT4 ADVANCED NETWORKS CONCEPTS****12Hrs.**

VPN - Remote Access VPN - site-to-site VPN - Tunneling to PPP - Security in VPN - MPLS - Operation - Routing - Tunneling and Use of FEC - Traffic Engineering and MPLS based VPN - Overlay Networks - P2P Connections - IPv4 vs IPv6.

**UNIT5 TELE COMMUNICATION AND CELLULAR NETWORKS****12Hrs.**

Telecommunications systems - GSM - Services - Architecture - Protocols - Handover - DECT - Architecture - Protocols - Handovers - TETRA - Bluetooth Technology - GPRS - WAP - WAP Architecture - WAP Protocols - WLL.

**Max. 60 Hours****COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Understand the routing in telephone networks.
- CO2 - Interpret the wired line and wireless network concepts and design.
- CO3 - Gain knowledge in interior routing and multicast routing protocols.
- CO4 - Clearly outline the logic behind VPNs.
- CO5 - Know the importance of tele communication and cellular network.
- CO6 - Understand the underlying working concepts of a real-time network.

**TEXT / REFERENCE BOOKS**

1. William Stallings, "High-Speed Networks and Internets, Performance and Quality of Service", 11th Edition, Pearson Education Asia. Reprint India 2002.
2. Martha Steenstrup, "Routing in Communication Networks", Prentice Hall International, New York, 1995.
3. Leon Garcia, Widjaja, "Communication Networks", Tata McGraw-Hill, Sixth Edition, 2002.
4. Aunurag Kumar, D. Manjunath, Joy Kuri, "Communication Networking", Morgan Kaufmann Publishers, 2011.
5. Jochen Schiller, "Mobile Communications", 2nd Edition, Pearson Education, 2008.
6. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", Second Edition, Tata McGraw Hill, 2010.

| SCS5104 | ADVANCED COMPUTER ARCHITECTURE | L | T | P | Credits | Total Marks |
|---------|--------------------------------|---|---|---|---------|-------------|
|         |                                | 3 | 1 | 0 | 4       | 100         |

**COURSE OBJECTIVES**

- To understand the evolution of computer architecture.
- To understand the state-of-the-art in computer architecture.
- To understand the design challenges in building a system.

**UNIT1 INTRODUCTION AND MEMORY ORGANISATION****12Hrs.**

CPU Organisation - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies.

**UNIT2 ADVANCED TECHNIQUES FOR EXPLOITING ILP****12Hrs.**

Introduction – Parallel Processing - Instruction Level Parallelism and its Exploitation - Concepts and Challenges - Compiler Techniques for Exposing ILP - Limitations on ILP for Realizable Processors - Hardware versus Software Speculation - Multithreading: Using ILP Support to Exploit Thread-Level Parallelism.

**UNIT3 MULTI-CORE ARCHITECTURES****12Hrs.**

SMT and CMP Architectures – Design Issues – Intel Multi-Core Architecture – SUN CMP Architecture – IBM Cell Architecture – HP Architecture – RISC Architecture.

**UNIT4 MULTIPROCESSORS****12Hrs.**

Symmetric and Distributed Shared Memory Architectures – Cache Coherence Issues - Performance Issues – Synchronization Issues – Models of Memory Consistency - Interconnection Networks – Buses, Crossbar and Multi-stage Switches.

**UNIT5 VECTOR PROCESSING & PARALLEL ALGORITHMS****12Hrs.**

Pipelining – Introduction - Vector Processing – Vector Operations - Introduction to Parallel Algorithms – Models of Computation - Selection – Merging on EREW and CREW.

**Max. 60 Hours****Course Outcome:**

- CO1: Understand the concepts of memory organization.  
 CO2 : Analyze and utilize the ILP techniques.  
 CO3 : Describe architectural features of advanced processors.  
 CO4 : Interpret performance of multiprocessors.  
 CO5: Design & develop vector processing and pipelining  
 CO6 : Describe the Concept of Parallel Processing and its applications in a processor.

**TEXT / REFERENCE BOOKS**

1. John L. Hennessy and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann/Elsevier, 4th edition, 2007.
2. John P. Hayes, "Computer Architecture and Organisation", McGraw Hill, 3rd Edition, 1998,
3. Hwang K. and Briggs, F.A., "Computer Architecture and Parallel Processing", McGraw Hill, 1985.
4. Selim G. Akl, "The Design and Analysis of Parallel Algorithms", Prentice Hall, New Jersey, 1989.
5. Joseph JaJa, "Introduction to Parallel Algorithms", Addison-Wesley, 1992.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 80****Exam Duration: 3Hrs.****PART A:** 6 Questions of 5 marks each without choice uniformly distributed**30 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 10 marks**50 Marks**

| SCS5106 | DISTRIBUTED OPERATING SYSTEMS | L | T | P | Credits | Total Marks |
|---------|-------------------------------|---|---|---|---------|-------------|
|         |                               | 3 | 1 | 0 | 4       | 100         |

**COURSE OBJECTIVES**

- To provide an introduction to the internal operation of distributed operating systems.
- In particular, it covers processes, scheduling, synchronization, communication, file systems.
- To provide better knowledge on shared memory and distributed memory paradigms.

**UNIT1 COMMUNICATION IN DISTRIBUTED SYSTEMS 12Hrs.**

Introduction - Goals of Distributed systems – Design issues – Transparency – flexibility – reliability – performance – scalability - Client – Server Model – Remote procedure call – Group Communication.

**UNIT2 SYNCHRONIZATION IN DISTRIBUTED SYSTEMS 12Hrs.**

Clock Synchronization – Mutual Exclusion – Election Algorithms – Deadlock in Distributed systems.

**UNIT3 PROCESSES IN DISTRIBUTED SYSTEMS 12Hrs.**

Threads – System Models – Workstation model – Using Idle Workstation – Processor Pool Model – Hybrid Model – Scheduling in Distributed Systems.

**UNIT4 DISTRIBUTED FILE SYSTEMS 12Hrs.**

Distributed File System Design – Distributed File System Implementation - File Usage – System Structure - File Caching – File Replications.

**UNIT5 DISTRIBUTED SHARED MEMORY & CASE STUDY 12Hrs.**

Introduction to Shared Memory – Consistency Models – Page Based Distributed Shared Memory – Shared Variable Distributed Shared Memory - Case Study - MACH.

Max. 60 Hours

**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Understand the group communication and distribution of the control towards the operating system.
- CO2 - Apply the concepts of synchronization and deadlocks in real computing problems.
- CO3 - Demonstrate the different techniques used in distributed Operating Systems.
- CO4 - Have practical exposure to the concepts of Distributed file system and its implementation.
- CO5 - Create, design and construct the distributed shared memory in the modern operating system.
- CO6 - Understand and implement a MACH.

**TEXT / REFERENCE BOOKS**

1. Andrew S. Tanenbaum, "Distributed Operating Systems", 1st Edition, Prentice Hall of India, 1995.
2. Pradeep K Sinha, "Distributed Operating Systems, Concepts & Design", Prentice Hall of India, 2009.

**END SEMESTER EXAM QUESTION PAPER PATTERN**

Max. Marks: 80

Exam Duration: 3Hrs.

**PART A:** 6 Questions of 5 marks each without choice uniformly distributed

30 Marks

**PART B:** 2 Questions from each unit of internal choice, each carrying 10 marks

50 Marks

| SCS5108 | PARALLEL SYSTEMS | L | T | P | Credits | Total Marks |
|---------|------------------|---|---|---|---------|-------------|
|         |                  | 3 | 1 | 0 | 4       | 100         |

### COURSE OBJECTIVES

- To understand the concepts of parallel computing and parallel systems' architecture.
- To understand the two popular parallel programming paradigms (message passing and shared memory).
- To understand major performance issues for parallel systems and programs.
- To iterate hot topics in research on parallel computing.

### UNIT1 ARCHITECTURES

12Hrs.

The changing role of parallelism - Basic Principles - Sources of inefficiency - Metrics: Execution time - speedup etc. - Throughput vs. latency - Scalability: massive parallelism - Amdahl's Law - Gustafson's Law - Parallel architectures - Trends in architectures - CMPs - GPUs and Grids - Multiprocessors - Multicomputers - Multithreading - Pipelining - VLIWs - Superscaling - Vectors - SIMDs - paradigm of shared-memory - distributed memory - interconnection networks - optical computing - systolic arrays - cache coherence - Model of parallelism: PRAM - CTA.

### UNIT2 PROGRAMMING MODELS

12Hrs.

Parallel Programming: Low Level Approaches - Threads - Message passing - Issues in scalability and portability - Transactional Memory - Parallel Programming: Higher Level Approaches - ZPL - Automatic Parallelization and HPF - Chapel - MapReduce.

### UNIT3 PRINCIPLES OF PARALLEL ALGORITHM DESIGN

12Hrs.

Preliminaries - Decomposition techniques - Characteristics of tasks and interactions - Mapping techniques for load balancing - Methods for containing interaction overheads - Parallel algorithm models - Basic communication operations.

### UNIT4 LOOP PARALLELIZATIONS

12Hrs.

Loop transformations, loop parallelizations, Data-Parallel and Data-Flow Systems Connection Machine CM5 - Data-Flow Models - Parallel Programming Concept dependence and loop parallelization - parallelism profiling Data-Path Design Parallel and Pipelined Design - Scheduling Parallel Programs - Optimal Scheduling Algorithms - Scheduling Heuristics - Loop Transformation and Scheduling - Parallelizing Serial Programs - Data Dependency Test - Parallelization Techniques - Instruction-Level Parallelism.

### UNIT5 SCHEDULING

12Hrs.

Task partitioning - data sharing and task distribution / scheduling - static, dynamic and speculative tasks - shared memory, message passing - check-in/check-out - collaborative real-time editing - version control systems - synchronization and communication fundamentals - synchronous, asynchronous scheduling - semantics - data sharing: race, dependence, the Bernstein condition - progress: lock and wait freedom - message passing: put/get, send/recv, collectives - Service Support - Resource Management - Availability - Reliability - Security - Fault Tolerance - Recovery - Protection - Scaling.

### COURSE OUTCOMES

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

- CO1 - Recognize various parallel computing and parallel system's architecture.
- CO2 - Describe the parallel programming model.
- CO3 - Design the principles of Parallel algorithm.
- CO4 - Analyse a problem, design a solution, and test their implementation in loop parallelizations.
- CO5 - Implement scheduling concept with synchronous and asynchronous.
- CO6 - Implement parallel computing to a variety of applications in Mathematics and Engineering.

Max. 60 Hours

### TEXT / REFERENCE BOOKS

1. Ananth Grama and George Karypis, "Introduction to parallel computing", Addison-Wesley 2009.
2. David Culler and Jaswinder Pal Singh, "Parallel Computer Architecture", Morgan Kaufmann, 1999, ISBN 1-55860-343-3.
3. Wilkinson B. & Allen M., "Parallel Programming: Techniques & Applications Using Networked Workstations", Prentice Hall (2nd Ed), 2005, ISBN: 0131918656

4. T.G.LewisandH.El-Rewini, "IntroductiontoParallelComputing", Prentice-Hall, EnglewoodCliffs, NJ, 1992.
5. K.ManiandS.Tayler, "AnIntroductiontoParallelProgramming" JonesandBarlettPublishers, 1992.
6. IanFoster, "DesigningandBuildingParallelPrograms", Addison-Wesley, 1994.
7. MichaelWolfe, "HighPerformanceCompilersforParallelComputing", Addison-Wesley, 1996, ISBN0-8053-2730-4.
8. U. Banerjee, "Loop Parallelization", Kluwer, 1994.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks:80****ExamDuration:3Hrs.****PART A:** 6 Questions of 5 marks each without choice uniformly distributed**30 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 10 marks**50 Marks**

| SCS5201 | BIG DATA ANALYTICS | L | T | P | Credits | Total Marks |
|---------|--------------------|---|---|---|---------|-------------|
|         |                    | 3 | 1 | 0 | 4       | 100         |

**COURSE OBJECTIVES**

- To understand big data analytics as the next wave for businesses looking for competitive advantage.
- To understand the financial value of big data analytics, explore tools and practices for working with big data.
- To understand how big data analytics can leverage into a key component.

**UNIT1 INTRODUCTION TO BIGDATA****12Hrs.**

Analytics–Nuances of big data–Value–Issues–Case for Big data–Big data options Team challenge– Big data sources– Acquisition– Nuts and Bolts of Big data. Features of Big Data–Security, Compliance, auditing and protection–Evolution of Big data– Best Practices for Big data Analytics–Big data characteristics–Volume, Veracity, Velocity, Variety–Data Appliance and Integration tools– Greenplum–Informatica.

**UNIT2 DATA ANALYSIS****12Hrs.**

Evolution of analytics scalability–Convergence–parallel processing systems–Cloud computing–grid computing–map reduce– enterprise analytics and box–analytic datasets–Analytic methods–analytic tools– Cognos–Microstrategy– Pentaho Analysis approaches– Statistical significance–business approaches–Analytic innovation–Traditional approaches–Iterative.

**UNIT3 STREAM COMPUTING****12Hrs.**

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– Realtime Analytics Platform (RTAP) applications–Case Studies–Real Time Sentiment Analysis, Stock Market Predictions.

**UNIT4 PREDICTIVE ANALYTICS AND VISUALIZATION****12Hrs.**

Predictive Analytics–Supervised–Unsupervised learning–Neural networks–Kohonen models–Normal– Deviations from normal patterns–Normal behaviours–Expert options–Variable entry–Mining Frequent item sets– Market based model– Apriori Algorithm–Handling large datasets in Main memory–Limited Pass algorithm– Counting frequent item sets in a stream– Clustering Techniques–Hierarchical–K-Means–Clustering high dimensional data Visualizations - Visual data analysis techniques , interaction techniques, Systems and applications.

**UNIT5 FRAMEWORKS AND APPLICATIONS****12Hrs.**

IBM for Big Data–Map Reduce Framework–Hadoop–Hive–Sharding–NoSQL Databases–S3–Hadoop Distributed file systems–Hbase– Impala–Analyzing big data with twitter–Big data for blogs .

**Max. 60 Hours****COURSE OUTCOMES:**

- CO1: List the components of Hadoop and Hadoop Eco-System  
 CO2: Access and Process Data on Distributed File System  
 CO3: Manage Job Execution in Hadoop Environment  
 CO4: Develop Big Data Solutions using Hadoop Eco System  
 CO5: Analyze Infosphere Big Insights Big Data Recommendations.  
 CO6: Able to do framework and Application

**TEXT / REFERENCE BOOKS**

1. Frank JOhlhorst, "Big Data Analytics: Turning Big Data into Big Money", Wiley and SAS Business Series, 2012.
2. Colleen Mccue, "Data Mining & Predictive Analysis: Intelligence Gathering and Crime Analysis", Elsevier, 2007.
3. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
4. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
5. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", Wiley and SAS Business Series, 2012.
6. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill, 2011.
7. Paul Zikopoulos, Dirk de Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big data–The big data platform", McGraw Hill, 2012.
8. Pete Warden, "Big Data" Glossary, O'Reilly, 2011.
9. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, 2008.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 80****Exam Duration: 3Hrs.****PART A:** 6 Questions of 5 marks each without choice uniformly distributed**30 Marks**



| SCS5607 | ETHICAL HACKING AND DIGITAL FORENSICS | L | T | P | Credits | Total Marks |
|---------|---------------------------------------|---|---|---|---------|-------------|
|         |                                       | 3 | 1 | 0 | 4       | 100         |

**COURSE OBJECTIVES**

- To learn various hacking techniques and attacks.
- To know how to protect data assets against attacks from the Internet.
- To evaluate where information networks are most vulnerable.
- To perform penetration tests into secure networks for evaluation purposes.
- To enable students to understand issues associated with the nature of forensics.

**UNIT1 HACKING WINDOWS****12Hrs.**

Hacking windows–Network hacking–Web hacking–Password hacking–A study on various attacks–Input validation attacks–SQL Injection attacks–Buffer overflow attacks–Privacy attacks.

**UNIT2 TCP/IP AND FIREWALLS****12Hrs.**

TCP/IP–Checksums–IP Spoofing port scanning, DNS Spoofing. Dos attacks–SYN attacks, Smurf attacks, UDP flooding, DDOS–Models. Firewalls–Packet filter firewalls–Packet Inspection firewalls–Application Firewalls - Batch File Programming.

**UNIT3 COMPUTER FRAUD****12Hrs.**

Fundamentals of Computer Fraud–Threat concepts–Framework for predicting inside attacks–Managing the threat–Strategic Planning Process.

**UNIT4 ARCHITECTURE STRATEGIES****12Hrs.**

Architecture strategies for computer fraud prevention–Protection of Websites–Intrusion detection system–NIDS, HIDS–Penetrating testing process–Web Services–Reducing transaction risks.

**UNIT5 FRAUD SELECTION & DETECTION****12Hrs.**

Key Fraud Indicator selection process - customized taxonomies – Key fraud signature selection process – Accounting Forensics–Computer Forensics–Journaling and its requirements–Standardized logging criteria–Journal risk and control matrix–Neural networks–Misused detection and Novelty detection.

**Max. 60 Hours****Course Outcomes**

On successful completion of this unit, students will be able to:

CO1. Describe the concept of ethical hacking.

CO2. Describe how to conduct an investigation using firewall and TCP/IP.

CO3. Identify the process in taking digital evidence

CO4. Analyze and report the latest ethical hacking techniques to expose potential cyber security vulnerabilities.

CO5. Critically review cybercrime and computer forensics techniques;

CO6. Apply and present the latest digital forensics and evidence analysis techniques; and

**TEXT / REFERENCE BOOKS**

1. Kenneth C. Brancik, "Insider Computer Fraud", Auerbach Publications Taylor & Francis, Group 2008.
2. Ankit Fadia, "Ethical Hacking", Second Edition Macmillan India Ltd, 2006

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 80****Exam Duration: 3Hrs.**

**PART A:** 6 Questions of 5 marks each without choice uniformly distributed

**30 Marks**

**PART B:** 2 Questions from each unit of internal choice, each carrying 10 marks

**50 Marks**

| SCS5619 | MOBILE AND PERVASIVE COMPUTING | L | T | P | Credits | Total Marks |
|---------|--------------------------------|---|---|---|---------|-------------|
|         |                                | 3 | 0 | 0 | 4       | 100         |

**COURSE OBJECTIVES**

- To understand the basics of Mobile computing and Personal computing.
- To learn the role of wireless networks in Mobile Computing and Pervasive Computing.
- To understand the architectures of mobile and pervasive applications.
- To become familiar with the pervasive devices and mobile computing platforms.

**UNIT1 INTRODUCTION****12Hrs.**

Differences between Mobile Communication and Mobile Computing – Functions – Applications and Services – Making Legacy Applications Mobile Enabled – Design Considerations – Integration of Wireless and Wired Networks – Standards Bodies – Pervasive Computing – Principles of Pervasive Computing – Categories of Pervasive Devices.

**UNIT2 3G AND 4G CELLULAR NETWORKS****12Hrs.**

Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – Radio Network Subsystem – UTRAN – NodeB – RNC functions – USIM – Protocol Stack – IMS Architecture – Handover – 3.5G and 3.9G brief discussion 4G LAN and Cellular Networks – WiMax IEEE 802.16d/e.

**UNIT3 SENSOR AND MESH NETWORKS****12Hrs.**

Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor Databases – Data Management in Wireless Mobile Environments – Wireless Mesh Networks – Architecture – Mesh Routers – Mesh Clients – Routing – Applications of Sensor and Mesh networks.

**UNIT4 CONTEXT AWARE COMPUTING****12Hrs.**

Adaptability – Mechanisms for Adaptation – Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene Analysis – Voronoi graphs – Types of Context – Role of Mobile Middleware – Service Discovery Middleware.

**UNIT4 APPLICATION DEVELOPMENT****12Hrs.**

Three tier architecture – Model View Controller Architecture – Information Access Devices – PDAs and Smart Phones – Smart Cards and Embedded Controls – Application Development on Android and iPhone.

**Max. 60 Hours****COURSE OUTCOMES**

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

- CO1 : Classify various types of Medium access methods in wireless communication.
- CO2 : Demonstrate the usage of Telecommunication systems.
- CO3 : Describe the behavior of network protocols stack.
- CO4 : Explain the Routing and Applications of MANET.
- CO5 : Implement mobile application using J2ME.
- CO6 : Explain the structure and components for Mobile IP and WAP

**TEXT / REFERENCE BOOKS**

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", Second Edition, Tata McGraw Hill, 2010.
2. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley, 2010.
3. Pei Zheng and Lionel M Li, "Smart Phone & Next Generation Mobile Computing", Morgan Kaufmann Publishers, 2006.
4. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufmann Publishers, 2004.
5. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions", Wiley, 2009.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 80****Exam Duration: 3Hrs.****PART A:** 6 Questions of 5 marks each without choice uniformly distributed**30 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 10 marks**50 Marks**

| SCS5623 | DATA MINING AND WAREHOUSING | L | T | P | Credits | Total Marks |
|---------|-----------------------------|---|---|---|---------|-------------|
|         |                             | 3 | 1 | 0 | 4       | 100         |

**COURSE OBJECTIVES**

- To understand Data mining principles and techniques and introduce Data Mining as a cutting edge business intelligence.
- To expose the student to the concepts of Data Warehousing Architecture and Implementation.
- To study the overview of developing areas – Web mining, Text mining and ethical aspects of Data mining and to identify Business applications and Trends of Data mining.

**UNIT1 INTRODUCTION****12Hrs.**

Datamining-Introduction-Data Mining Functionalities-Steps in Data Mining Process-Architecture of a Typical Data Mining Systems-Classification of Data Mining Systems-Major Issues in Data Mining Data Preprocessing: Data Preprocessing-Data Cleaning-Integration-Transformation-Reduction-Entropy based Discretization.

**UNIT2 CONCEPT DESCRIPTION AND ASSOCIATION RULES****12Hrs.**

**Concept Description:** Attribute Oriented Induction-Mining Class Comparisons-Presentation of both Characterization and Comparison **Association Rules:** Frequent Pattern Mining-Apriori Algorithm-Frequent Pattern Growth Tree Algorithm-Mining Multilevel Association Rules-Mining Quantitative Association Rules-Constraint based Association Mining.

**UNIT3 PREDICTIVE MODELING****12Hrs.**

**Classification:** Decision Tree Induction-Gini Index- Bayes Theorem-Naive Bayesian Classification-K Nearest Neighbor Classifiers-Other Classification Methods **Prediction:** Linear Regression-Non-Linear Regression **Clusters Analysis:** Types of Data in Cluster Analysis-Categorization of Major Clustering Methods-Partitioning Methods –Hierarchical Methods

**UNIT4 DATA WAREHOUSING****12Hrs.**

Introduction-Multi Dimensional Data Model-Data Warehouse Architecture-Data Warehouse Implementation- from Data warehousing to Data Mining-OLAP-Need-Categorization of OLAP Operations.

**UNIT5 APPLICATIONS****12Hrs.**

Data Mining Applications-Social Impacts of Data Mining- An Introduction to DB Miner-Case Studies-Mining WWW-Text Mining -Mining Spatial Databases-Multimedia Data Mining-Tools.

**Max. 60 Hours****COURSE OUTCOMES:**

- CO1: Data preprocessing and data quality.  
 CO2: Modeling and design of data warehouses.  
 CO3: Algorithms for data mining. Skills:  
 CO4: Be able to design data warehouses.  
 CO5: Ability to apply acquired knowledge for understanding data and select suitable methods for data analysis.  
 CO6: Able to know about Application of data warehouse and data mining.

**TEXT / REFERENCE BOOKS**

1. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 2002.
2. Alex Berson, Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw-Hill, 2004.
3. Usama M. Fayyad, Gregory Piatetsky - Shapiro, Padhraí Smyth and Ramasamy Uthurusamy, "Advances In Knowledge Discovery And Data Mining", The M.I.T Press, 1996.
4. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
5. Sean Kelly, "Data Warehousing In Action", John Wiley & Sons Inc., 1997.

**END SEMESTER EXAM QUESTION PAPER PATTERN****Max. Marks: 80****Exam Duration: 3Hrs.****PART A:** 6 Questions of 5 marks each without choice uniformly distributed**30 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 10 marks**50 Marks**

|         |                            |   |   |   |         |             |
|---------|----------------------------|---|---|---|---------|-------------|
| SCS6531 | DATA STRUCTURES LABORATORY | L | T | P | Credits | Total Marks |
|         |                            | 0 | 0 | 6 | 3       | 100         |

**SUGGESTED LIST OF EXPERIMENTS**

1. Polynomial Differentiation.
2. Printing the node details levelwise
3. Searching the given element from  $N \times N$  matrix using Binary search
4. Knapsack Problem using Greedy Method
5. Traveling salesman Problem
6. Binary Tree Traversal
7. Implementing RED BLACK Trees
8. Minimum Spanning Tree using KRUSKAL'S Algorithm
9. Minimum Spanning Tree using FLOYD-WARSHALL Algorithm
10. Implementing Splay trees
11. Implementing quad trees

|         |                                          |   |   |   |         |             |
|---------|------------------------------------------|---|---|---|---------|-------------|
| SCS6532 | COMPUTATIONAL INTELLIGENCE<br>LABORATORY | L | T | P | Credits | Total Marks |
|         |                                          | 0 | 0 | 6 | 3       | 100         |

**SUGGESTED LIST OF EXPERIMENTS**

1. Implementation of Backpropagation Learning Algorithm.
2. Implementation of Genetic Algorithms.
3. Particle Swarm Optimization.
4. Ant Colony Optimization.
5. Artificial Bee Colony.
6. Sheep Flock Optimization.
7. Implementation of Clonal Algorithm.
8. Implement Fuzzy Controller.

| SCS6533 | WEB TECHNOLOGY LABORATORY | L | T | P | Credits | Total Marks |
|---------|---------------------------|---|---|---|---------|-------------|
|         |                           | 0 | 0 | 6 | 3       | 100         |

### SUGGESTED LIST OF EXPERIMENTS

#### HTML

- Create a personalized web page using HTML. The web page must include links about yourself, your curriculum vitae (forms), album (img tags), tutorials and contacts. All types of hyper-link should be used.
- Create a web page using frames, ordered and unordered list.

#### XML

- Develop a simple application using XML

#### JAVA SCRIPT

- Perform client side validation for an e-mail registration form using JavaScript.
- Create a simple quiz application with timer using JavaScript.
- Develop an application to fetch information from a database with AJAX

#### JAVA – APPLET

- Create an applet application and load an image in the applet.
- Create a Java application to show how mouse events are handled.

#### ASP

- Develop a simple application using ASP

#### PHP

- Develop a simple application using PHP

#### WEB APPLICATIONS

- Creating a simple web service using SOAP, Cloud service, Parallelization.

#### COURSE OUTCOMES:

- CO1: Students are able to develop a dynamic webpage by the use of java script and DHTML.
- CO2: Students will be able to write a well formed / valid XML document.
- CO3: Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
- CO4: Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
- CO5: Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.
- CO6: Student will be able to write PHP and Web Applications.

| SIT5201 | CLOUD COMPUTING | L | T | P | Credits | Total Marks |
|---------|-----------------|---|---|---|---------|-------------|
|         |                 | 3 | 1 | 0 | 4       | 100         |

**COURSE OBJECTIVES**

- Gain knowledge in Basics of Cloud computing
- Understand Cloud Computing architecture and industry frameworks such as MapReduce
- Discuss practical applications of cloud computing

**UNIT1 UNDERSTANDING CLOUD COMPUTING****12Hrs.**

History of Cloud computing - Cloud Computing Reference Model - NIST Architectural Framework - Types of Clouds - pros and cons of cloud computing - difference between web 2.0 and cloud - key challenges in cloud computing - Major Cloud players - Cloud Deployment Models - Virtualization in Cloud Computing - types of virtualization - web services - key concepts.

**UNIT2 CLOUD SERVICE MODELS****12Hrs.**

Software as a Service (SaaS) - Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Service Oriented Architecture (SoA) - Elastic Computing - On Demand Computing - Parallelization in Cloud Computing - cloud resource management - dynamic resource allocation - Optimal allocation of cloud models.

**UNIT3 CLOUD DEPLOYMENT MODELS****12Hrs.**

Deployment models: Public cloud - Private Cloud - Hybrid cloud - Community cloud - Deployment of applications on the cloud - Hypervisor - Case studies - Xen, HyperV, VirtualBox, Eucalyptus, Amazon Cloud Computing - Amazon S3 - Amazon EC2 - Windows Azure - creating and deploying cloud services, Working with Google App Engine, Disaster Recovery.

**UNIT4 VIRTUALIZATION****12Hrs.**

Cloud data centers - Energy efficiency in data centre - Mobile cloud computing service models - Need for virtualization - Types of Virtualization - Virtualization OS - VMWare, KVM - System VM - Process VM - Virtual Machine Monitor - Properties - Interpretation and Binary Translation - HLLVM.

**UNIT5 CLOUD SECURITY****12Hrs.**

Cloud security - Security threats and solutions in clouds - Auditing protocols - dynamic auditing - storage security - Privacy preserving - Fully Homomorphic Encryption - Big data security - Cloud availability - DoS attacks - Fault tolerance management in cloud computing - Cloud computing in India.

**Max. 60 Hours****COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 : Comprehend the type, architecture and features of a given Cloud setup with its suitability for a given application.

CO2 : Compare the types of cloud services and connect to the service requirements of an application.

CO3 : Deploy an application on suitable cloud and make use of the suitable virtualization tool to create cloud infrastructure.

CO4 : Evaluate a cloud data centre and measure its energy efficiency.

CO5 : Appraise the Cloud security and the associated risks to protect the online and cloud infrastructure from external

threats and third party attacks.

CO6 : Manage and collaborate cloud services with dynamic auditing.

**TEXT / REFERENCE BOOKS**

1. Cloud computing a practical approach - Anthony T. Velte, Toby J. Velte, Robert Elsen, Peter T. ATAMcGraw-Hill, New Delhi - 2010.