Semester: I Employability Year: 2014-2015

Course Title: Advances In Operating Systems	Course Code: 14SCS11
Credits(L:T:P):4:0:0	Core/Elective: Core
Type of Course: Lecture	Total Contact Hours: 50 Hrs

COURSE OBJECTIVES:

- To learn the fundamentals of Operating Systems
- To gain knowledge on Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols
- To gain insight on to the distributed resource management components viz. the algorithms for implementation of distributed shared memory, recovery and commit protocols
- To know the components and management aspects of Real time, Mobile operating Systems.

TOPICS:

MODULE I

Operating System Overview, Process description & control

Operating System Objectives and Functions, The Evolution of Operating Systems, Major Achievements, Developments Leading to Modern Operating Systems, Microsoft Windows Overview, Traditional UNIX Systems, Modern UNIX Systems, Linux, What is a Process?, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues. UNIX SVR4 Process Management.

10 Hours

Module II

Threads, SMP, and Microkernel, Virtual Memory.

Processes and Threads, Symmetric Multiprocessing (SMP), Microkernels, Windows Vista Thread and SMP Management, Solaris Thread and SMP Management, Linux Process and Thread Management. Hardware and Control Structures, Operating System Software, UNIX and Solaris Memory Management, Linux Memory Management, Windows Vista Memory Management, Summary.

10 Hours

Module III

Multiprocessor and Real-Time Scheduling

Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling, UNIX PreclsSl) Scheduling, Windows Vista Scheduling. Process Migration, Distributed Global States, Distributed Mutual Exclusion, Distributed Deadlock.

10 Hours

Module IV

Embedded Operating Systems

Embedded Systems, Characteristics of Embedded Operating Systems, eCOS, TinyOS, Computer Security Concepts, Threats, Attacks, and Assets, Intruders, Malicious Software Overview, Viruses, Worms, and Bots, Rootkits.

10 Hours

MODULEV

Kernel Organization

Using Kernel Services, Daemons, Starting the Kernel , Control in the Machine , Modules and Device Management, MODULEOrganization, MODULEInstallation and Removal, Process and Resource Management, Running Process

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Visvesvaraya Technological University, Belagavi.

Manager, Creating a new Task , IPC and Synchronization, The Scheduler , Memory Manager , The Virtual Address Space, The Page Fault Handler , File Management.

The windows NT/2000/XP kernel: Introduction, The NT kernel, Objects , Threads, Multiplication Synchronization, Traps, Interrupts and Exceptions, The NT executive , Object Manager, Process and Thread Manager , Virtual Memory Manager, I/o Manager, The cache Manager , Kernel local procedure calls and IPC, The native API, subsystems.

10 Hours

Course Outcomes:

The students should be able to:

-Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system

- Learn the various resource management techniques for distributed systems
- Identify the different features of real time and mobile operating systems

-Modify existing open source kernels in terms of functionality or features used.

Text Books:

1. William Stallings: Operating Systems: Internals and Design Principles, 6th Edition, Prentice Hall, 2013.
2. Gary Nutt: Operating Systems, 3rd Edition, Pearson, 2014.

Reference Books:

1. Silberschatz, Galvin, Gagne: Operating System Concepts, 8th Edition, Wiley, 2008
2. Andrew S. Tanenbaum, Albert S. Woodhull: Operating Systems, Design and Implementation, 3rd Edition, Prentice Hall, 2006.
3. Pradeep K Sinha: Distribute Operating Systems, Concept and Design, PHI, 2007

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Dept. of Computer Science and Engineering

the basis of properties of the other entities in its neighborhood. This state can represent a distance to other nodes, indication that there is a neighbor
with the certain properties, characteristic of neighborhood density and so on. A network is stored as a set of nodes and each node contains a list of adjacent node IDs. Mapper emits messages for each node using ID of the adjacent node as a key. Reducer must re compute state and rewrite node with the new state. Implement this scenario.

Course Outcomes:

The students should be able to:

-Demonstrate and experiment simple Cloud Applications
-Apply resource allocation, scheduling algorithms.
- Implement Map-Reduce concept.
- Create virtual machines from available physical resources.
- Setup a private cloud.
- Familiarize with Open Stack.

Text Book:

1. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.

REFERENCES:

1. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.
2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.

Semester: I Employability Year: 2014-2015

Course Title: Advances in Database Management Systems	Course Code: 14SCS13
Credits(L:T:P):3:0:1	Core/Elective: Core
Type of Course: Lecture & Practical	Total Contact Hours: 50 Hrs

COURSE OBJECTIVES:

- To acquire knowledge on parallel and distributed databases and its applications.
- To study the usage and applications of Object Oriented database
- To understand the basic concepts, principles of intelligent databases.
- To understand the advanced topics of data warehousing and mining .
- To learn emerging and advanced data models
- To acquire inquisitive attitude towards research topics in databases.

Topics:

MODULE I

Review of Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and relational database schemas; Update operations, transactions and dealing with constraint violations.

Overview of Object-Oriented Concepts – Objects, Encapsulation, Polymorphism, Type and class hierarchies etc.

10 Hours

Module II

Object and Object-Relational Databases: Object Oriented Concepts: – Objects, complex objects; Object model of ODMG, Object definition Language ODL; Object Query Language OQL; Overview of C++ language binding; Conceptual design of Object database. Overview of object relational features of SQL; Object-relational features of Oracle; Implementation and related issues for extended type systems; The nested relational model.

10 Hours

Module III

Parallel and Distributed Databases: Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations; Parallel query optimizations; Introduction to distributed databases; Distributed DBMS architectures; Storing data in a Distributed DBMS; Distributed catalog management; Distributed Query processing; Updating distributed data; Distributed transactions; Distributed Concurrency control and Recovery.

10 Hours

Module IV

Data Warehousing, Decision Support and Data Mining: Introduction to decision support; OLAP, multidimensional model; Window queries in SQL; Finding answers quickly; Implementation techniques for OLAP; Data Warehousing; Views and Decision support, View materialization, Maintaining materialized views. Introduction to Data Mining; Counting co-occurrences; Mining for rules; Tree-structured rules; Clustering; Similarity search over sequences; Incremental mining and data streams; Additional data mining tasks.

10 Hours

Module V

Enhanced Data Models for Some Advanced Applications: Active database concepts and triggers; Temporal, Spatial, and Deductive Databases – Basic concepts. More Recent Applications: Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management. **10 Hours**

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(The following tasks can be implemented on Oracle or any other suitable RDBMS with support for Object features)

1. Develop a database application to demonstrate storing and retrieving of BLOB and CLOB objects.

2. Develop a database application to demonstrate the representation of multivalued attributes, and the use of nested tables to represent complex objects. Write suitable queries to demonstrate their use.

3. Design and develop a suitable Student Database application. One of the attributes to me maintained is the attendance of a student in each subject for which he/she has enrolled. Using TRIGGERS, write active rules to do the following:

a. Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the Head of the Department concerned.

b. Whenever, the marks in an Internal Assessment Test are entered, check if the marks are less than 40%; if so, notify the Head of the Department concerned.

4. Design, develop, and execute a program in a language of your choice to implement any one algorithm for mining association rules. Run the program against any large database available in the public domain and discuss the results.

COURSE OUTCOMES:

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

- Select the appropriate high performance database like parallel and distributed database
- Model and represent the real world data using object oriented database
- Embed the rule set in the database to implement data warehousing of mining
- Choose and design database for recent applications database for better interoperability

TEXT BOOKS:

1. Elmasri and Navathe: Fundamentals of Database Systems, Pearson Education, 2013.

2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2013.

REFERENCE BOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 6th Edition, McGraw Hill, 2010.

Semester: I Employability **Year: 2014-2015**

Course Title: Multi-Core Architecture and Programming	**Course Code: 14SCS14**
Credits(L:T:P):4:0:0	**Core/Elective: Core**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course Objectives:

- To understand the recent trends in the field of Computer Architecture and identify performance related parameters
-To appreciate the need for parallel processing
- To expose the students to the problems related to multiprocessing
- To understand the different types of multicore architectures
- To understand the concepts of multi threading and OPENMP.

Topics:

MODULE I

Introduction to Multi-core Architecture: Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper- Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl's Law, Growing Returns: Gustafson's Law. **System Overview of Threading:** Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization.

10 Hours

Module II

Fundamental Concepts of Parallel Programming: Designing for Threads, Task Decomposition, Data Decomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives.

10 Hours

MODULE III

Threading and Parallel Programming Constructs: Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control- based Concepts, Fence, Barrier, Implementation-dependent Threading Features. **Threading APIs :** Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft. NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking.

10 Hours

MODULE IV

OpenMP: A Portable Solution for Threading: Challenges in Threading a Loop, Loop-carried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance-oriented Programming, Using Barrier and No wait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of Shared

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Variables, Intel Task queuing Extension to OpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging, performance. **10 Hours**

MODULE V

Solutions to Common Parallel Programming Problems: Too Many Threads, Data Races, Deadlocks, and Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily Contended Locks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem, Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in the Cache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency, Current IA-32 Architecture, Itanium Architecture, High-level Languages, Avoiding Pipeline Stalls on IA-32,Data Organization for High Performance. **10 Hours**

Course Outcomes:

The students should be able to:

- Identify the limitations of ILP and the need for multi-core architectures.
- Solve the issues related to multiprocessing and suggest solutions.
- Point out the salient features of different multi-core architectures and how they exploit parallelism.

Text Book

1. Multicore Programming , Increased Performance through Software Multi-threading by Shameem Akhter and Jason Roberts , Intel Press , 2006

Semester: I Employability Year: 2014-2015

Course Title: ~~Advances in Digital~~ Image Processing	Course Code: 14SCS151
Credits(L:T:P):4:0:0	Core/Elective: Elective
Type of Course: Lecture	Total Contact Hours: 50 Hrs

Course objectives:

- To understand the image fundamentals and mathematical transforms necessary for image processing and to study the image enhancement techniques.
- To understand the image segmentation and representation techniques.
- To understand how image are analyzed to extract features of interest.
- To introduce the concepts of image registration and image fusion.
- To analyze the constraints in image processing when dealing with 3D data sets.

Topics:

MODULE I

Introduction: What is Digital Image Processing, Origins of Digital Image Processing, Examples of fields that use DIP, Fundamental Steps in Digital Image Processing, Components of an Image Processing System. **Digital Image Fundamentals:** Elements of Visual Perception, A Simple Image Formation Model, Basic Concepts in Sampling and Quantization, Representing Digital Images, Spatial and Gray-level Resolution, Zooming and Shrinking Digital Images, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

10 Hours

MODULE II

Image Enhancement in the Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods. **Image Enhancement in the Frequency Domain:** Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering.

10 Hours

MODULE III

Image Restoration: A Model of the Image degradation/Restoration process, Noise Models, Restoration in the Presence of Noise Only–Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations , Estimating the Degradation Function, Inverse Filtering ,Minimum Mean Square Error (Wiener) Filtering, Constrained Least Square Filtering, Geometric Mean Filter.

10 Hours

MODULE IV

Color Fundamentals: Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Color Segmentation, Noise in Color Images, Color Image Compression. **Wavelets and Multiresolution Processing:** Image Pyramids, Subband coding, The Haar Transform, Multiresolution Expansions, Wavelet Transforms in one Dimension, Fast Wavelet Transform, Wavelet Transforms in Two Dimensions, Wavelet Packets. **Image Compression:** Fundamentals, Image Compression Models, Error-free (Lossless) compression, Lossy Compression.

10 Hours

MODULE V:

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Morphological Image Processing: Preliminaries, Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation, Some Basic Morphological Algorithms. **Image Segmentation:** Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation.

10 Hours

Course Outcomes:

The students will be able to:

- Understand image formation and the role human visual system plays in perception of gray and color image data.
- Apply image processing techniques in both the spatial and frequency (Fourier) domains.
- Design image analysis techniques in the form of image segmentation and to evaluate the
- Methodologies for segmentation.
- Conduct independent study and analysis of feature extraction techniques.
- Understand the concepts of image registration and image fusion.
- Analyze the constraints in image processing when dealing with 3D data sets and to apply image
- Apply algorithms in practical applications.

TEXT BOOKS

1. Rafael C Gonzalez and Richard E. Woods: Digital Image Processing, PHI 2nd Edition 2005

REFERENCES:

1. A. K. Jain: Fundamentals of Digital Image Processing, Pearson, 2004.
2. Scott.E.Umbaugh: Digital Image Processing and Analysis, CRC Press, 2014.
3. S.Jayaraman, S.Esakkirajan, T.Veerakumar: Digital Image Procesing, McGraw Hill Ed. (India) Pvt. Ltd., 2013.

Semester: I Employability Year: 2014-2015

Course Title: Advances in Storage Area Networks	Course Code: 14SCS152
Credits(L:T:P):4:0:0	Core/Elective: Elective
Type of Course: Lecture	Total Contact Hours: 50 Hrs

Course Objectives:

- To understand the fundamentals of storage centric and server centric systems
- To understand the metrics used for Designing storage area networks
- To understand the RAID concepts
- To enable the students to understand how data centre's maintain the data with the concepts of backup mainly remote mirroring concepts for both simple and complex systems

Topics:

MODULE I

Introduction: Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks The Data Storage and Data Access problem; The Battle for size and access. **Intelligent Disk Subsystems:** Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems, Availability of disk subsystems.

10 Hours

MODULE II

I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. **Network Attached Storage:** The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. **File System and NAS**: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

10 Hours

MODULE III

Storage Virtualization: Definition of Storage virtualization ; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.

10 Hours

MODULE IV

SAN Architecture and Hardware devices: Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective. **Software Components of SAN:** The switch's Operating system; Device Drivers; Supporting the switch's components; Configuration options for SANs.

10 Hours

MODULE V

Management of Storage Network: System Management, Requirement of management System, Support by Management System, Management Interface, Standardized Mechanisms, Property Mechanisms, In-band Management,

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Use of SNMP, CIM and WBEM, Storage Management Initiative Specification (SMI-S), CMIP and DMI, Optional Aspects of the Management of Storage Networks, Summary

10 Hours

Course Outcomes:

The students should be able to:

- Identify the need for performance evaluation and the metrics used for it
- Apply the techniques used for data maintenance.
- Realize storage virtualization concept,
- Develop techniques for evaluating policies for LUN masking, file systems.

Text Book:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2013.

Reference Books:

1. Robert Spalding: "Storage Networks The Complete Reference", Tata McGraw-Hill, 2011.
2. Marc Farley: Storage Networking Fundamentals – An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems, Cisco Press, 2005.
3. Richard Barker and Paul Massiglia: "Storage Area Network Essentials A CompleteGuide to understanding and Implementing SANs", Wiley India, 2006.

Semester: I Skill Development Year: 2014-2015

Course Title: Embedded Computing Systems	Course Code: 14SCS153
Credits(L:T:P):4:0:0	Core/Elective: Elective
Type of Course: Lecture	Total Contact Hours: 50 Hrs

COURSE

OBJECTIVES

- Provide a general overview of Embedded Systems
- Show current statistics of Embedded Systems
- Design a complete microprocessor-based hardware system
- Design, code, compile, and test real-time software
- Integrate a fully functional system including hardware and software
- Gain the ability to make intelligent choices between hardware/software tradeoffs.

Topics:

MODULE I

Introduction to embedded systems: Embedded systems, Processor embedded into a system, Embedded hardware units and device in a system, Embedded software in a system, Examples of embedded systems, Design process in embedded system, Formalization of system design, Design process and design examples, Classification of embedded systems, skills required for an embedded system designer.

7 Hours

MODULE II

Devices and communication buses for devices network :IO types and example, Serial communication devices, Parallel device ports, Sophisticated interfacing features in device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock, Networked embedded systems, Serial bus communication protocols, Parallel bus device protocols-parallel communication internet using ISA, PCI, PCI-X and advanced buses, Internet enabled systems-network protocols, Wireless and mobile system protocols.

13 Hours

MODULE III

Device drivers and interrupts and service mechanism: Programming-I/O busy-wait approach without interrupt service mechanism, ISR concept, Interrupt sources, Interrupt servicing (Handling) Mechanism, Multiple interrupts, Context and the periods for context switching, interrupt latency and deadline, Classification of processors interrupt service mechanism from Context-saving angle, Direct memory access, Device driver programming.

10 Hours

MODULE IV

Interprocesses communication and synchronization of processes, Threads and tasks: Multiple process in an application, Multiple threads in an application, Tasks, Task states, Task and Data, Clear-cut distinction between functions. ISRS and tasks by their characteristics, concept and semaphores, Shared data, Inter-process communication, Signal function, Semaphore functions, Message Queue functions, Mailbox functions, Pipe functions, Socket functions, RPC functions.

10 Hours

MODULE V

Real-time operating systems: OS Services, Process management, Timer functions, Event functions, Memory management, Device, file and IO subsystems management, Interrupt routines in RTOS environment and handling of interrupt source calls, Real-time operating systems, Basic design using an RTOS, RTOS task scheduling models, interrupt latency and response of the tasks as performance metrics, OS security issues. **Introduction to embedded**

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Dept. of Computer Science and Engineering

software development process and tools, Host and target machines, Linking and location software.

10 Hours

Course Outcomes:

The students should be able to:

- Knowledge to distinguish the characteristics of embedded computer systems.
- Ability examines the various vulnerabilities of embedded computer systems.
- Ability to design embedded systems.
- Awareness of the changing landscape in embedded systems

Text Books:

1. **Raj Kamal**, "Embedded Systems: Architecture, Programming, and Design" 2nd edition , Tata McGraw hill-2013

Chapters: Chapter 1.1 to 1.5, 1.8 to 1.12, Chapter 3, 4, 7, 8 and 13.1 to 13.3.

References:

2. **Marilyn Wolf** ,"Computer as Components, Principles of Embedded Computing System Design" 3rd edition , Elsevier-2014 .

Semester: I Employability Year: 2014-2015

Course Title: Advances in Computer Graphics	Course Code: 14SCS154
Credits(L:T:P):4:0:0	Core/Elective: Elective
Type of Course: Lecture	Total Contact Hours: 50 Hrs

Course Objectives:

- Learn basic and fundamental computer graphics techniques.
- Learn image synthesis techniques;
- Examine applications of modeling, design and visualization.
- Learn different color modeling and computer animation
- Learn hierarchical modeling and graphing file formats.

Topics:

MODULE I

Three-Dimensional Object Representations: Polyhedra, OpenGL Polyhedron Functions, Curved Surfaces, Quadric Surfaces, Super quadrics, OpenGL Quadric-Surface and Cubic-Surface Functions, Blobby Objects, Spline Representations, Cubic-Spline Interpolation Methods, Bezier Spline Curves, Bazier Surfaces B-Spline Curves, B-Spline Surfaces, Beta- Splines, Retional Splines, Conversion Between Spline Representations, Displaying Spline Curves and rfaces, OpenGL Approximation-Spline Functions, Sweep Representations, Constructive Solid –Geometry Method, Octrees, BSP Trees, Fractal-Geometry Methods, Shape Grammars and Others Procedural Methods, Particle Systems, Physically Based Modeling, Visualization Of Data Sets.

10 Hours

MODULE II

Visible-Surface Detection Methods: Classification Of Visible –Surface Detection Algorithms, Back-Face Method, Depth-Buffer Method, A-Buffer Method, Scan-Line Method, BSP-Tree Method, Area-Subdivision Method, Octree Methods, Ray-Casting Method, Comparison of Visibility –Detection Methods, Curved Surfaces, Wire-Frame Visibility –Detection Functions.

10 Hours

MODULE III

Illumination Models and Surface- Rendering Methods: Light Sources, Surface Lighting Effects, Basic Illumination Models, Transparent Surfaces, Atmospheric Effects, Shadows, Camera parameters, Displaying light intensities, Halftone patterns and dithering techniques, polygon rendering methods, ray-tracing methods, Radiosity lighting model, Environment mapping, Photon mapping, Adding surface details, Modeling surface details with polygons, Texture mapping, Bump mapping, OpenGL Illumination and surface-rendering functions, openGL texture functions.

10 Hours

MODULE IV

Color models, color applications and Computer animation: Properties of light, Color models, Standard primaries and the chromaticity diagram, The RGB color model, The YIQ and related color models, The CMY and CMYK color models, The HSV color model, The HLS color model, Color Selection and applications. Raster methods for computer animation, Design of animations sequences, Traditional animation techniques,

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Semester: II Employability **Year: 2014-2015**

Course Title: Managing Big Data	Course Code: 14SCS21
Credits(L:T:P):3:0:1	Core/Elective: Core
Type of Course: Lecture & Practical	Total Contact Hours: 50 Hrs

Course Objectives:

- To Understand big data for business intelligence
- To Learn business case studies for big data analytics
- To Understand Nosql big data management
- To manage Big data without SQL
- To understanding map-reduce analytics using Hadoop and related tools

TOPICS:

MODULE I
UNDERSTANDING BIG DATA **10 Hours**

What is big data – why big data –.Data!, Data Storage and Analysis, Comparison with Other Systems, Rational Database Management System , Grid Computing, Volunteer Computing, convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics

MODULE II
NOSQL DATA MANAGEMENT **10 Hours**

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schema less databases – materialized views – distribution models – sharding — version – Map reduce – partitioning and combining – composing map-reduce calculations

MODULE III
BASICS OF HADOOP **10 Hours**

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures

MODULE IV
MAPREDUCE APPLICATIONS **10 Hours**

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats

MODULE V
HADOOP RELATED TOOLS **10 Hours**

Hbase – data model and implementations – Hbase clients – Hbase examples –praxis. Cassandra – Cassandra data model – cassandra examples – cassandra clients –Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

LAB Experiments

Exercise 1 --- HDFS

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Start by reviewing HDFS. You will find that its composition is similar to your local Linux file system. You will use the hadoop fs command when interacting with HDFS.

1. Review the commands available for the Hadoop Distributed File System:
2. Copy file foo.txt from local disk to the user's directory in HDFS
3. Get a directory listing of the user's home directory in HDFS
4. Get a directory listing of the HDFS root directory
5. Display the contents of the HDFS file user/fred/bar.txt
6. Move that file to the local disk, named as baz.txt
7. Create a directory called input under the user's home directory
8. Delete the directory input old and all its contents
9. Verify the copy by listing the directory contents in HDFS:

Exercise 2 --- MapReduce

1. Create a JOB and submit to cluster
2. Track the job information
3. Terminate the job
4. Counters in MR Jobs with example
5. Map only Jobs and generic map examples
6. Distributed cache example
7. Combiners, Secondary sorting and Job chain examples

Exercise 3 --- MapReduce (Programs)

Using movie lens data

1. List all the movies and the number of ratings
2. List all the users and the number of ratings they have done for a movie
3. List all the Movie IDs which have been rated (Movie Id with at least one user rating it)
4. List all the Users who have rated the movies (Users who have rated at least one movie)
5. List of all the User with the max, min, average ratings they have given against any movie
6. List all the Movies with the max, min, average ratings given by any user

Exercise4 – Extract facts using Hive

Hive allows for the manipulation of data in HDFS using a variant of SQL. This makes it excellent for transforming and consolidating data for load into a relational database. In this exercise you will use HiveQL to filter and aggregate click data to build facts about user's movie preferences. The query results will be saved in a staging table used to populate the Oracle Database.

The moveapp_log_json table contains an activity column. Activity states are as follows:

1. RATE_MOVIE
2. COMPLETED_MOVIE
3. PAUSE_MOVIE
4. START_MOVIE
5. BROWSE_MOVIE
6. LIST_MOVIE
7. SEARCH_MOVIE
8. LOGIN
9. LOGOUT
10. INCOMPLETE_MOVIE

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Semester: II Employability **Year: 2014-2015**

Course Title: Advances in Computer Networks	**Course Code: 14SCS22**
Credits(L:T:P):3:0:1	**Core/Elective: Core**
Type of Course: Lecture & Practical	**Total Contact Hours: 50 Hrs**

Course Objectives:

- To become familiar with the basics of Computer Networks
- To understand various Network architectures
- Concepts of fundamental protocols
- To understand the network traffic, congestion, controlling and resource allocation.

Topics:

MODULE I

Foundation

Building a Network, Requirements, Perspectives, Scalable Connectivity, Cost-Effective Resource sharing, Support for Common Services, Manageability, Protocol layering, Performance, Bandwidth and Latency, Delay X Bandwidth Product, Perspectives on Connecting, Classes of Links, Reliable Transmission, Stop-and-Wait , Sliding Window, Concurrent Logical Channels.

T1: Chapter 1.1, 1.2, 1.5.1, 1.5.2., 2.1, 2.5 **T2: Chapter 4** **10 Hours**

MODULE II

Internetworking- I

Switching and Bridging, Datagram's, Virtual Circuit Switching, Source Routing, Bridges and LAN Switches, Basic Internetworking (IP), What is an Internetwork ?, Service Model, Global Addresses, Datagram Forwarding in IP, sub netting and classless addressing, Address Translation(ARP), Host Configuration(DHCP), Error Reporting(ICMP), Virtual Networks and Tunnels.

T1: Chapter 3.1, 3.2, **10 Hours**

MODULE III

Internetworking- II

Network as a Graph, Distance Vector(RIP), Link State(OSPF), Metrics, The Global Internet, Routing Areas, Routing among Autonomous systems(BGP), IP Version 6(IPv6), Mobility and Mobile IP

T1: Chapter 3.3, 4.1.1,4.1.3 **T2**:Chapter 13.1 to 13.18 , Ch 18. **10 Hours**

MODULE IV

End-to-End Protocols

Simple Demultiplexer (UDP), Reliable Byte Stream(TCP), End-to-End Issues, Segment Format, Connecting Establishment and Termination, Sliding Window Revisited, Triggering Transmission, Adaptive Retransmission, Record Boundaries, TCP Extensions, Queuing Disciplines, FIFO, Fair Queuing, TCP Congestion Control, Additive Increase/ Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery.

T1: Chapter 5.1, 5.2.1 to 5.2.8, 6.2, 6.3 **10 Hours**

MODULE V

Congestion Control and Resource Allocation

Congestion-Avoidance Mechanisms, DEC bit, Random Early Detection (RED), Source-Based Congestion Avoidance. The Domain Name System(DNS),Electronic Mail(SMTP,POP,IMAP,MIME),World Wide Web(HTTP),Network Management(SNMP) .

T1: Chapter 6.4 **T2**: Chapter 23.1 to 23.16, Chapter 24, Chapter 25, Chapter 27.1 to 27.8 **10 Hours**

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Laboratory Work:

PART A: Implement the following using C/C++:

1. Write a program to transfer the contents of a requested file from server to the client using TCP/IP Sockets (using TCP/IP Socket programming).
2. Write a program to archive Traffic management at Flow level by implementing Closed Loop Control technique. (Leaky Bucket Algorithm)
3. Write a program to implement dynamic routing strategy in finding optimal path for data transmission. (Bellman ford algorithm).
4. Write a program to implement Link State Routing (Dijkstra Algorithm).
5. Write a program for implementing the error detection technique while data transfer in unreliable network code using CRC (16-bits) Technique.
6. Write a program for providing security for transfer of data in the network. (RSA Algorithm)
7. Write a program for encrypting 64 bit playing text using DES algorithm.

PART B: Simulation Programs using OPNET /NS2 or any other equivalent software

1. Simulate a 3 node point to point network with duplex links between them. Set the Queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate a four-node point-to-point network, and connect the links as follows: n0->n2, n1->n2 and n2->n3. Apply TCP agent changing the parameters and determine the number of packets sent/received by TCP/UDP
3. Simulate the different types of internet traffic such as FTP and TELNET over network and analyze the throughput.

Course Outcomes:

The students should be able to:

- List and classify network services, protocols and architectures, explain why they are layered.
- Choose key Internet applications and their protocols, and apply to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.
- Explain develop effective communication mechanisms using techniques like connection establishment, queuing theory, recovery Etc.
- Explain various congestion control techniques.

Text books:

1. **T1: Larry Peterson and Bruce S Davis** "Computer Networks :A System Approach" 5th Edition , Elsevier -2014
2. **T2: Douglas E Comer,** "Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI - 2014

References:

1. **Uyless Black** "Computer Networks, Protocols , Standards and Interfaces" 2nd Edition - PHI
2. **Behrouz A Forouzan** "TCP/IP Protocol Suite" 4th Edition – Tata McGraw-Hill

Semester: II Employability **Year: 2014-2015**

Course Title: Advanced Algorithms	Course Code: 14SCS23
Credits(L:T:P):4:0:0	Core/Elective: Core
Type of Course: Lecture	Total Contact Hours: 50 Hrs

COURSE OBJECTIVES

- To learn the graph search algorithms.
- To study network flow and linear programming problems.
- To learn the hill climbing and dynamic programming design techniques.
- To develop recursive backtracking algorithms.
- To get an awareness of NP completeness and randomized algorithms.

Topics:

MODULE I

Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods.

10 Hours

MODULE II

Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching.
Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT.

10 Hours

MODULE III

Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization.

10 Hours

MODULE IV

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.

10 Hours

MODULE V

Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms.

10 Hours

Course Outcomes:

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

- Design and apply iterative and recursive algorithms.
- Design and implement optimization algorithms in specific applications.
- Design appropriate shared objects and concurrent objects for applications.

TEXT BOOKS:

1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, Prentice-Hall of India, 2010.
2. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, 2002.

REFERENCE BOOKS:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Universities press, 2007.

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Semester: II Employability **Year: 2014-2015**

Course Title: Artificial Intelligence and Agent Technology	**Course Code: 14SCS24**
Credits(L:T:P):4:0:0	**Core/Elective: Core**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course Objectives:

- To Apply a given AI technique to a given concrete problem
- To Implement non-trivial AI techniques in a relatively large system
- To understand uncertainty and Problem solving techniques.
- To understand various symbolic knowledge representation to specify domains and reasoning tasks of a situated software agent.
- To understand different logical systems for inference over formal domain representations, and trace how a particular inference algorithm works on a given problem specification.
- To understand various learning techniques and agent technology.

TOPICS:

MODULE I

What is Artificial Intelligence: The AI Problems, The Underlying assumption, What is an AI Technique?, The Level of the model, Criteria for success, some general references, One final word and beyond.

Problems, problem spaces, and search: Defining, the problem as a state space search, Production systems, Problem characteristics, Production system characteristics, Issues in the design of search programs, Additional Problems.

Intelligent Agents: Agents and Environments, The nature of environments, The structure of agents.

Text Book 1: Chapter 1 & 2 Text Book 2: Chapter 2 10 Hours

MODULE II

Heuristic search techniques: Generate-and-test, Hill climbing, Best-first search, Problem reduction, Constraint satisfaction, Mean-ends analysis.

Knowledge representation issues: Representations and mappings, Approaches to knowledge representation, Issues in knowledge representation, The frame problem.

Using predicate logic: Representing simple facts in logic, representing instance and ISA relationships, Computable functions and predicates, Resolution, Natural Deduction.

Logical Agents: Knowledge –based agents, the Wumpus world, Logic-Propositional logic, Propositional theorem proving, Effective propositional model checking, Agents based on propositional logic.

Text Book 1: Chapter 3, 4 & 5 Text Book 2: Chapter 6 10 Hours

MODULE III

Symbolic Reasoning Under Uncertainty: Introduction to nonmonotonic reasoning, Logic for nonmonotonic reasoning, Implementation Issues, Augmenting a problem-solver, Implementation: Depth-first search, Implementation: Breadth-first search.

Statistical Reasoning: Probability and bayes Theorem, Certainty factors and rule-based systems, Bayesian Networks, Dempster-Shafer Theory, Fuzzy logic.

Quantifying Uncertainty: Acting under uncertainty, Basic probability notation, Inference using full joint distributions, Independence, Bayes' rule and its use, The Wumpus world revisited.

Text Book 1: Chapter 7 & 8 Text Book 2: Chapter 13 10Hours

MODULE IV

Weak Slot-and-filter structures: Semantic Nets, Frames.

Strong slot-and –filler structures: Conceptual dependency, scripts, CYC.

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Adversarial Search: Games, Optimal Decision in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions, Stochastic Games, Partially Observable Games, State-Of-The-Art Game Programs, Alternative Approaches, Summary

Text Book 1: Chapter 9 & 10 Text Book 2: Chapter 5 **10 Hours**

MODULE V

Learning From examples: Forms of learning, Supervised learning, Learning decision trees, Evaluating and choosing the best hypothesis, The theory of learning ,PAC, Regression and Classification with linear models, Nonparametric models, Support vector machines, Ensemble learning.

Learning Probabilistic Models: Statistical learning, learning with complete data, learning with hidden variables: The EM algorithm.

Text Book 2: Chapter 18 & 20 **10 Hours**

COURSE OUTCOMES:

The students are able to:

- Design intelligent agents for problem solving, reasoning, planning, decision making, and learning. specific design and performance constraints, and when needed, design variants of existing algorithms.
- Apply AI technique on current applications.
- Problem solving, knowledge representation, reasoning, and learning.

Text Books.

1. Elaine Rich,Kevin Knight, Shivashanka B Nair:Artificial Intelligence, Tata CGraw Hill 3rd edition. 2013
2. Stuart Russel, Peter Norvig: Artificial Intelligence A Modern Approach, Pearson 3rd edition 2013.

Reference Books:

3. Nils J. Nilsson: "Principles of Artificial Intelligence", Elsevier, ISBN-13: 9780934613101

Semester: II Employability **Year: 2014-2015**

Course Title: Web Services	**Course Code: 14SCS251**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course objectives:

- To provide an in-depth knowledge of Web Services.
- To understand the fundamental concepts of Web services.
- To understand the fundamental concepts of WSDL Web Services.
- To design Web service Architecture.
- To Study Building Blocks of Web services.

TOPICS:

MODULE I

Middleware: Understanding the middle ware, RPC and Related Middle ware, TP Monitors, Object Brokers, Message-Oriented Middleware. **10 Hours**

MODULE II

Web Services: Web Services Technologies, Web Services Architecture. **10 Hours**

MODULE III

Basic Web Services Technology: WSDL Web Services Description Language, UDDI Universal Description Discovery and Integration, Web Services at work interactions between the Specifications, Related Standards. **10 Hours**

MODULE IV

Service Coordination Protocols: Infrastructure for Coordination Protocols, WS- Coordination, WS-Transaction, Rosetta Net and Other Standards Related to Coordination Protocols. **10 Hours**

MODULE V

Service Composition: Basic of Service Composition, A New Chance of Success for Composition, Services Composition Models, Dependencies between Coordination and Composition, BPEL: Business Process Execution Language for Web Services, Outlook, Applicability of the Web Services, Web services as a Problem and a Solution : AN Example. **10 Hours**

Course Outcomes:

The students should be able to:

- Bind and unbind services in UDDI.
- Develop WSDL document
- Implement web service client to call public service.
- Implement a service and exposing it as public service.

Text Books:

1. Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju: Web Services(Concepts ,Architectures and Applications), Springer International Edition 2009.

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Semester: II Employability **Year: 2014-2015**

Course Title: Information And Network Security	**Course Code: 14SCS252**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course Objectives:

- To understand the fundamentals of Cryptography
- To acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to deploy encryption techniques to secure data in transit across data networks
- To design security applications in the field of Information technology

TOPICS:

MODULE I

Classical Encryption Techniques

Symmetric Cipher Model, Cryptography, Cryptanalysis and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher, Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad. **Block Ciphers and the data encryption standard:** Traditional block Cipher structure, stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel Cipher, The data encryption standard, DES encryption, DES decryption, A DES example, results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of function F, key schedule algorithm.

10 Hours

MODULE II

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key cryptosystems. Applications for public-key cryptosystems, requirements for public-key cryptosystems. public-key cryptanalysis. The RSA algorithm, description of the algorithm, computational aspects, the security of RSA. **Other Public-Key Cryptosystems:** Diffie-hellman key exchange, The algorithm, key exchange protocols, man in the middle attack, Elgamal Cryptographic systems, Elliptic curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves over Zp, elliptic curves overGF(2m), Elliptic curve cryptography, Analog of Diffie-hellman key exchange, Elliptic curve encryption/ decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA.

10 Hours

MODULE III

Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure .**User Authentication:** Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification.

10 Hours

MODULE IV

Wireless network security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function, .

Web Security Considerations: Web Security Threats, Web Traffic Security Approaches. **Secure Sockets Layer:** SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic

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Computations. **Transport Layer Security:** Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify And Finished Messages, Cryptographic Computations, Padding. **HTTPS** Connection Initiation, Connection Closure. **Secure Shell (SSH)** Transport Layer Protocol, User Authentication Protocol, Connection Protocol.

10 Hours

MODULE V

Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow. **IP Security:** IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations, authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits.

10 Hours

Course Outcomes:

The students be able to

- Analyze the vulnerabilities in any computing system and hence be able to design a
- security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.

Text Books:

1. William Stallings: Cryptography and Network Security, Pearson 6th edition. 2013

References

1. V k Pachghare: Cryptography and Information Security, PHE ,2013.

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Semester: II Employability **Year: 2014-2015**

Course Title : Pattern Recognition	Course Code: 14SCS253
Credits(L:T:P):4:0:0	Core/Elective: Elective
Type of Course: Lecture	Total Contact Hours: 50 Hrs

Course Objectives:

- To study the mathematical morphology necessary for Pattern recognition.
- To introduce the student to various Pattern recognition techniques.
- To study the Representation and description and feature extraction.
- To study the principles of decision trees and clustering in pattern recognition.

TOPICS:

MODULE I

Introduction: Definition of PR, Applications, Datasets for PR, Different paradigms for PR, Introduction to probability, events, random variables, Joint distributions and densities, moments. Estimation minimum risk estimators, problems. **10 Hours**

MODULE II

Representation: Data structures for PR, Representation of clusters, proximity measures, size of patterns, Abstraction of Data set, Feature extraction, Feature selection, Evaluation. **10 Hours**

MODULE III

Nearest Neighbor based classifiers & Bayes classifier: Nearest neighbor algorithm, variants of NN algorithms, use of NN for transaction databases, efficient algorithms, Data reduction, prototype selection, Bayes theorem, minimum error rate classifier, estimation of probabilities, estimation of probabilities, comparison with NNC, Naive Bayes classifier, Basyessian belief network. **10 Hours**

MODULE IV

Decision Trees: Introduction, DT for PR, Construction of DT, Splitting at the nodes, Over-fitting & Pruning, Examples. **10 Hours**

MODULE V

Clustering: Hierarchical (Agglomerative, single/complete/average linkage, wards, Partitional (Forgy's, k-means, Iso-data), clustering large data sets, examples. **10 Hours**

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

- Develop and analyze decision tress.
- Design the nearest neighbor classifier.
- Develop algorithms for Pattern Recognition.

Text Books:

1. Pattern Recognition (An Introduction) , V Susheela Devi, M Narsimha Murthy, Universities Press, ISBN 978-81-7371-725-3,2011.
2. Pattern Recognition & Image Analysis, Earl Gose, Richard Johnsonbaugh, Steve Jost. PHI ISBN-81-203-1484-0, 1996.

References

1. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000.

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Semester: II Employability **Year: 2014-2015**

Course Title: Optical Networks	**Course Code: 14SCS254**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course Objectives:

-To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
-To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors
-To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes
-To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration
-To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM

Topics:

MODULE I

Client Layers of the Optical Layer: SONET/SDH: Multiplexing, CAT and LCAS, Sonnet/SDH Layers, SONET Frame Structure, SONET/SDH Physical Layer, Elements of a SONET/SDH Infrastructure, **Optical Transport Network:** Hierarchy, Frame Structure, Multiplexing, Generic Framing Procedure Ethernet: Frame Structure, Switches, Ethernet Physical Layer, Carrier Transport IP: Routing and Forwarding, Quality of Service. **Multiprotocol Label Switching:** Labels and Forwarding, Quality of Service, Signaling and Routing, Carrier Transport, Resilient Packet Ring: Quality of Service, Node Structure, Fairness Storage-Area
Networks: Fiber Channel.

10 Hours

MODULE II

WDM Network Elements

Optical Line Terminals, Optical Line Amplifiers, Optical Add/Drop Multiplexers: OADM Architectures, **Reconfigurable OADMs Optical Cross connects**: All-Optical OXC Configurations.

10 Hours

MODULE III

Control and Management

Network Management Functions: Management Framework, Information Model, Management Protocols. Optical Layer Services and Interfacing, Layers within the Optical Layer, Multivendor Interoperability. **Performance and Fault Management:** The Impact of Transparency, BER Measurement, Optical Trace, Alarm Management, Data Communication Network (DCN) and Signaling, Policing, Optical Layer Overhead, Client Layers. **Configuration Management**: Equipment Management, Connection Management, Adaptation Management. Optical Safety: Open Fiber Control Protocol

10 Hours

MODULE IV

Basic Concepts, Protection in SONET/SDH:

Point-to-Point Links, Self-Healing Rings, Unidirectional Line-Switched Rings, Bidirectional Line-Switched Rings, Ring Interconnection and Dual Homing. **Protection in the Client Layer**: Protection in Resilient Packet Rings, Protection in Ethernet, Protection in IP, Protection in MPLS, Why Optical Layer Protection: Service Classes Based on Protection. Optical Layer Protection Schemes: 1+1 OMS Protection, 1:1 OMS Protection, OMS-DPRing, OMS-SPRing, 1: N Transponder Protection, 1+1 OCh Dedicated Protection, OCh-SPRing, OCH-Mesh Protection, GMPLS Protection, Interworking between Layers.

10 Hours

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Visvesvaraya Technological University, Belagavi

MODULE V

WDM Network Design:

Cost Trade-OFFS: A Detailed Ring Network Example LTD and RWA Problems, Light path Topology Design, Routing and Wavelength Assignment, Wavelength Conversion. Dimensioning Wavelength- Routing Networks, **Statistical Dimensioning Models:** First-Passage Model, Blocking Model, Maximum **Load Dimensioning Models**: Offline Light path Requests, Online RWA in Rings.

10 Hours

COURSE OUTCOMES:

The students will be able to:

- Gain Knowledge on fundamentals of optical network.
- Explore optical network architectures ranging from optical access networks to backbone optical transport networks.
- Choose approaches and methodologies of optical network for design effective optimization;
- Apply Techniques of optical network survivability.
- Gain knowledge on Problem solving skills and critical thinking in the discipline of optical networks.

Text Books:

1. Optical Networks by Rajeev Ramaswamy, Kumar N Sivarajan, Galen H Sasaki, Elsevier Publication 3rd Edition, 2009.

References:

1. Uyless Black, Optical Networks-Third generation transport system: Pearson 2013.

Semester: II **Year: 2014-2015**

Course Title: Advanced Algorithms Laboratory	Course Code: 14SCS26
Credits(2) (L:T:P):0:0:3	Core/Elective: Core
Type of Course: Practical	Total Contact Hours: 42 Hrs

COURSE OBJECTIVES

- To implement the graph search algorithms.
- To implement the string matching algorithms.
- To implement the modular linear equation algorithms.

LABORATORY WORK:

Note: The following programs can be executed on Java/C#/any equivalent tool/langauge by adapting exception handling technique wherever it is suitable.

1. Design, develop, and write a program to implement the Bellman-Ford algorithm and determine its performance. Give its applications.

2. Design, develop, and write a program to implement a Monte Carlo algorithm to test the **primality** of a given integer and determine its performance.

3. Design, develop, and write a program to solve string matching problem using naïve approach and the KMP algorithm. Compare their performances.

4. Design, develop, and write a program to solve String matching problem using Finite Automata and determine its performance.

5. Design, develop, and write a program to solve String matching problem using Robin Karp algoritm and determine its performance.

Course Outcomes:

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

- Design and apply graph search algorithms.
- Design and implement string matching algorithms.
- Design modular linear equation algorithms.

Semester: IV Employability **Year: 2014-2015**

Course Title: Machine Learning Techniques	Course Code: 14SCS41
Credits(L:T:P):3:0:1	Core/Elective: Core
Type of Course: Lecture & Practical	Total Contact Hours: 50 Hrs

COURSE OBJECTIVES:

- To understand the basic concepts of learning and decision trees.
- To understand the neural networks and genetic algorithms
- To understand the Bayesian techniques
- To understand the instant based learning
- To understand the analytical learning and reinforced learning

TOPICS:

MODULE I

INTRODUCTION, CONCEPT LEARNING AND DECISION TREES

Learning Problems – Designing Learning systems, Perspectives and Issues – Concept Learning – Version Spaces and Candidate Elimination Algorithm – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search. **10 Hrs**

MODULE II

NEURAL NETWORKS AND GENETIC ALGORITHMS

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evolution and Learning. **10 Hrs**

MODULE III

BAYESIAN AND COMPUTATIONAL LEARNING

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probably Learning – Sample Complexity for Finite and Infinite Hypothesis Spaces – Mistake Bound Model. **10 Hrs**

MODULE IV

INSTANT BASED LEARNING AND LEARNING SET OF RULES

K- Nearest Neighbor Learning – Locally Weighted Regression – Radial Basis Functions – Case-Based Reasoning – Sequential Covering Algorithms – Learning Rule Sets – Learning First Order Rules – Learning Sets of First Order Rules – Induction as Inverted Deduction – Inverting Resolution **10 Hrs**

MODULE V

ANALYTICAL LEARNING AND REINFORCED LEARNING

Perfect Domain Theories – Explanation Based Learning – Inductive-Analytical Approaches - FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning **10 Hrs**

LABORATORY WORK

(The following tasks can be implemented in a language of your choice or any tools available)

1) Implement the CANDIDATE – ELIMINATION algorithm. Show how it is used to learn from training examples and hypothesize new instances in Version Space.
2) Implement the FIND–S algorithm. Show how it can be used to classify new instances of target concepts. Run the experiments to deduce instances and hypothesis consistently.

3) Implement the ID3 algorithm for learning Boolean–valued functions for classifying the training examples by searching through the space of a Decision Tree.
4) Design and implement the Back-propagation algorithm by applying it to a learning task involving an application like FACE RECOGNITION.
5) Design and implement Naïve Bayes Algorithm for learning and classifying TEXT DOCUMENTS.

COURSE OUTCOMES:

On Completion of the course, the students will be able to

- Choose the learning techniques with this basic knowledge.
- Apply effectively neural networks and genetic algorithms for appropriate applications.
- Apply bayesian techniques and derive effectively learning rules.
- Choose and differentiate reinforcement and analytical learning techniques

TEXT BOOK:

1. Tom M. Mitchell, "Machine Learning", McGraw-Hill Education (INDIAN EDITION), 2013.

REFERENCES:

2. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Ed., PHI Learning Pvt. Ltd., 2013.
3. T. Hastie, R. Tibshirani, J. H. Friedman, "The Elements of Statistical Learning", Springer; 1st edition, 2001.

Semester: IV Employability **Year: 2014-2015**

Course Title: Computer Vision	**Course Code: 14SCS421**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

Course Objectives:

- To review image processing techniques for computer vision
- To understand shape and region analysis
- To understand Hough Transform and its applications to detect lines, circles, ellipses
- To understand three-dimensional image analysis techniques
- To understand motion analysis
- To study some applications of computer vision algorithms

TOPICS:

MODULE I

CAMERAS: Pinhole Cameras**, Radiometry – Measuring Light:** Light in Space, Light Surfaces, Important Special Cases, **Sources, Shadows, And Shading:** Qualitative Radiometry, Sources and Their Effects, Local Shading Models, Application: Photometric Stereo, Interreflections: Global Shading Models, **Color:** The Physics of Color, Human Color Perception, Representing Color, A Model for Image Color, Surface Color from Image Color.

10 Hours

MODULE II

Linear Filters: Linear Filters and Convolution, Shift Invariant Linear Systems, Spatial Frequency and Fourier Transforms, Sampling and Aliasing, Filters as Templates, **Edge Detection:** Noise, Estimating Derivatives, Detecting Edges, **Texture:** Representing Texture, Analysis (and Synthesis) Using Oriented Pyramids, Application: Synthesis by Sampling Local Models, Shape from Texture.

10 Hours

MODULE III

The Geometry of Multiple Views: Two Views, **Stereopsis:** Reconstruction, Human Stereposis, Binocular Fusion, Using More Cameras, **Segmentation by Clustering:** What Is Segmentation?, Human Vision: Grouping and Getstalt, Applications: Shot Boundary Detection and Background Subtraction, Image Segmentation by Clustering Pixels, Segmentation by Graph-Theoretic Clustering,

10 Hours

MODULE IV

Segmentation by Fitting a Model: The Hough Transform, Fitting Lines, Fitting Curves, Fitting as a Probabilistic Inference Problem, Robustness, **Segmentation and Fitting Using Probabilistic Methods:** Missing Data Problems, Fitting, and Segmentation, The EM Algorithm in Practice, **Tracking With Linear Dynamic Models:** Tracking as an Abstract Inference Problem, Linear Dynamic Models, Kalman Filtering, Data Association, Applications and Examples.

10 Hours

MODULE V

Geometric Camera Models: Elements of Analytical Euclidean Geometry, Camera Parameters and the Perspective Projection, Affine Cameras and Affine Projection Equations, **Geometric Camera Calibration:** Least-Squares Parameter Estimation, A Linear Approach to Camera Calibration, Taking Radial Distortion into

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Dept. of Computer Science and Engineering
Visvesvaraya Technological University, Belgaum

Account, Analytical Photogrammetry, An Application: Mobile Robot Localization, **Model- Based Vision:** Initial Assumptions, Obtaining Hypotheses by Pose Consistency, Obtaining Hypotheses by pose Clustering, Obtaining Hypotheses Using Invariants, Verification, Application: Registration In Medical Imaging Systems, Curved Surfaces and Alignment. **10 Hours**

Course Outcomes:

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

- Implement fundamental image processing techniques required for computer vision
- Perform shape analysis
- Implement boundary tracking techniques
- Apply chain codes and other region descriptors
- Apply Hough Transform for line, circle, and ellipse detections.
- Apply 3D vision techniques.
- Implement motion related techniques.
- Develop applications using computer vision techniques.

TEXT BOOKS

1. David A. Forsyth and Jean Ponce: Computer Vision – A Modern Approach, PHI Learning (Indian Edition), 2009.

REFERENCES:

4. E. R. Davies: Computer and Machine Vision – Theory, Algorithms and Practicalities, Elsevier (Academic Press), 4th edition, 2013.

Semester: IV Employability **Year: 2014-2015**

Course Title: Wireless Networks And Mobile Computing	**Course Code: 14SCS424**
Credits(L:T:P):4:0:0	**Core/Elective: Elective**
Type of Course: Lecture	**Total Contact Hours: 50 Hrs**

COURSE OBJECTIVES

- To introduce the concepts of wireless communication.
- To understand various propagation methods, Channel models, capacity calculations multiple antennas and multiple user techniques used in the mobile communication.
- To understand CDMA, GSM, Mobile IP, WImax
- To understand Different Mobile OS
- To learn various Markup Languages
- CDC, CLDC, MIDP; Programming for CLDC, MIDlet model and security concerns

TOPICS:

MODULE I

Mobile Computing Architecture: Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing. **Wireless Networks** : Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications, GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS, Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

10 Hours

MODULE II

Mobile Client: Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6. **10 Hours**

MODULE III

Mobile OS and Computing Environment: Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Symbian OS, Linux and Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

10 Hours

MODULE IV

Building, Mobile Internet Applications: Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

10 Hours

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Dept. of Computer Science and Engineering
Visvesvaraya Technological University, Belagavi

MODULE V

J2ME: Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

10 Hours

COURSE OUTCOMES:

The student should be able to:

- Work on state of art techniques in wireless communication.
- Explore CDMA, GSM, Mobile IP, WiMax
- Work on Different Mobile OS
- Develop program for CLDC, MIDP let model and security concerns

TEXT BOOKS:

1. Ashok Talukder, Roopa Yavagal, Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2nd Edition, Tata McGraw Hill, 2010.

2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley India, 2003

REFERENCE BOOKS:

1. Raj kamal: Mobile Computing, Oxford University Press, 2007.

2. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.

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NOTE:

- *Lab Classes for these Core Subjects are Compulsory (Practical will be Evaluated for 20 marks and Internal assessment for 30 marks). Lab journals Should be Maintained.
- # Seminar: Topics should be chosen from IEEE/ACM/Elsevier/Springer/ any Refereed - Journals /Transactions. Encourage students to convert these seminar topics into a good survey paper or technical paper

III Semester:

- Internship: The student shall undergo Internship for 16 weeks.
- Seminar / Presentation on Internship: The student shall make a midterm presentation of the activities undertaken during the first eight weeks of internship to a panel comprising Internship Guide, a senior faculty from the department and Head of the Department of the college.
- Project Phase: I - Problem formulation and submission of synopsis of Project to the Head of the Department of the college with the approval of the Guide within eight weeks from the commencement of III Semester.
- Report on Internship: The College shall facilitate and monitor the student internship program. The internship report of each student shall be submitted to the Head of the Department of the college with the approval of the Guide.
- Evaluation of Internship - To be carried out by the Internal Guide of the college and the respective Head of the Department.
- Viva-Voce on Internship Report- To be conducted internally by the Internship Guide (from the college) and the External Guide under whose supervision the student has carried out the internship.
- Project Phase : II - Preliminary work on Project Implementation.

IV Semester:

- Interim Evaluation of Project : Comprising Evaluation of Project Phase – I and Project Phase – II – By Internal Guide after Ten weeks from the commencement of Fourth Semester.
- Project Phase-III : Finalization of Project work, dissertation report writing and submission of dissertation report.
- Evaluation of Dissertation / Final Project:
- Final evaluation of project to be carried out after 24 weeks from the date of commencement of 4th semester.
- The Internal Examiner (the project guide with a teaching experience of at least three years) and External Examiner shall be appointed by the University for the final evaluation of Project.
- Internal Examiner shall carry out the evaluation for 100 Marks, and
- External Examiner, shall carry out the evaluation for 100 Marks.
- The average of the marks allotted by the Internal Examiner and the External examiner shall be the final marks of the Project Evaluation.
- Viva – Voce : The Viva-Voce shall be conducted jointly by Internal Examiner and External Examiner for 100 Marks.

Employability

SEMESTER I

WIRELESS AD-HOC NETWORKS

Course Code	**: 14SCN11**	**Credits(L:T:P): 3:0:1**
Core/Elective	**: Core**	**Type of Course: Lecture and practical**
Total Contact Hours : 50		

COURSE OBJECTIVES :

- To explore the design space and conduct trade-off analysis between performance and resources.
- To Determine suitable medium access protocols and radio hardware.
- To learn Provision quality of service, fault-tolerance, security and other dependability requirements while coping with resource constraints.
- To explore the Ad-hoc network concepts by using network simulators.

TOPICS

MODULE I

Ad hoc Wireless Networks: Introduction, Issues in Ad hoc Wireless Networks, Ad hoc Wireless Internet; MAC Protocols for Ad hoc Wireless Networks: Introduction, Issues in Designing a MAC Protocol, Design Goals of MAC Protocols, Classification of MAC protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based Protocols with Scheduling Mechanisms, MAC Protocols that Use Directional Antennas (Chapter 5: 5.1-5.3, Chapter 6: 6.1-6.8)

10 Hours

MODULE II

Routing Protocols for Ad Hoc Wireless Networks: Introduction, Issues in Designing a Routing Protocol for Ad hoc Wireless Networks; Classification of Routing Protocols; Table Driven Routing Protocols; On-Demand Routing Protocols, Hybrid Routing Protocols, Hierarchical Routing Protocols and Power-Aware Routing Protocols (Chapter 7: 7.1-7.6, 7.8, 7.9)

10 Hours

MODULE III

Multicast Routing in Ad hoc Wireless Networks: Introduction, Issues in Designing a Multicast Routing Protocol, Operation of Multicast Routing Protocols, An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols, Tree-Based Multicast Routing Protocols and Mesh-Based Multicast Routing Protocols. (Chapter 8: 8.1-8.7)

10 Hours

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Dept. of Computer Science and Engineering

MODULE IV

Transport Layer and Security Protocols for Ad hoc Networks: Introduction, Issues in Designing a Transport Layer Protocol; Design Goals of a Transport Layer Protocol; Classification of Transport Layer Solutions; TCP over Transport Layer Solutions; Other Transport Layer Protocols for Ad hoc Networks; Security in Ad hoc Wireless Networks, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management and Secure Touting Ad hoc Wireless Networks. (Chapter 9: 9.1-9.6, 9.7-9.12)

10 Hours

MODULE V

Quality of Service and Energy Management in Ad hoc Wireless Networks: Introduction, Issues and Challenges in Providing QoS in Ad hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions; Energy Management in Ad hoc Wireless Networks: Introduction, Need for Energy Management in Ad hoc Wireless Networks, Classification of Energy Management Schemes, Battery Management Schemes, Transmission Management Schemes, System Power Management Schemes. (Chapter 10: 10.1-10.5, Chapter 11: 11.1-11.6)

10 Hours

LABORATORY WORK

Note: Standard Network Parameters and supporting protocols may be assumed for simulation. Any suitable network simulator may be used. (Preferably NS2 or NS3 Simulator)

1. Develop unicast routing protocols using any suitable Network Simulator for (Mobile Ad hoc Networks) MANET to find the best route using the any one of routing protocols from each category from table-driven (e.g., link state or DSDV) on demand (e.g., DSR, AODV, TORA), hybrid (e.g., ZRP, contact-based architectures) and hierarchical (e.g., cluster based.) The efficient path/ route should be established for source and destination data transmission using routing protocols. Understand the advantages and disadvantages of each routing protocol types by observing the performance metrics of the routing protocol. In that way the best application/environment suitable routing protocol can be identified in each category.

2: Develop multicast routing protocols using any suitable Network Simulator for MANET in which session nodes are connecting through either tree(MAODV, MCEDAR) or mesh (ODMRP, CAMP, FGMP) structure. Analyze

the performance metrics of multicast routing protocols with unicast routing protocols.

3. Develop MAC Protocol using any suitable Network Simulator for MANETs to send the packet without any contention through wireless link using the following MAC protocols: (CSMA/CA (802.11), MACA, MACAW, PAMAS, SMAC). Analyze its performance with increasing node density and mobility.

4. Develop and Analyze the performance of TCP connection when it is used for wireless networks. You will find performance of TCP decreases dramatically when a TCP connection traverses a wireless link on which packets may be lost due to wireless transmission errors. Make use of Active Queue Management Technique to control congestion on Wireless Networks. Evaluate the performance of FIFO, RED and WFQ over wireless networks using suitable Network Simulator.

5. Simulate MANET environment using suitable Network Simulator and test with various mobility model such as Random way point, group mobility, highway model, Manhattan model, hybrid models) (Spatial correlation, temporal correlation, relative speed, link durations). Analyze throughput, PDR and delay with respect to different mobility models.

COURSE OUTCOMES :

Students will be able to

- Apply knowledge of wireless Ad-hoc networks to various application areas.
- Design, implement and maintain wireless Ad-hoc networks.
- Formulate and solve problems creatively.
- Practical knowledge acquired by hands-on session.

TEXT BOOKS:

1. C. Siva Ram Murthy & B. S. Manoj: Ad hoc Wireless Networks, 2nd Edition, Pearson Education, 2011

REFERENCES:

1. Ozan K. Tonguz and Gianguigi Ferrari: Ad hoc Wireless Networks, John Wiley, 2007.
2. Xiuzhen Cheng, Xiao Hung, Ding-Zhu Du: Ad hoc Wireless Networking, Kluwer Academic Publishers, 2004.

SEMESTER I

ADVANCES IN STORAGE AREA NETWORK

Course Code	: 14SCN14	Credits(L:T:P): 4:0:0	
Core/Elective	: Core	Type of Course: Lecture	
Total Contact Hours : 50			

Course Objectives:

- To understand the fundamentals of storage centric and server centric systems
- To understand the metrics used for Designing storage area networks
- To understand the RAID concepts
- To enable the students to understand how data centre's maintain the data with the concepts of backup mainly remote mirroring concepts for both simple and complex systems
- To appreciate the use of cables technologies used in SAN technology.

TOPICS

MODULE I

Introduction: Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. Case study: Replacing a server with Storage Networks The Data Storage and Data Access problem; The Battle for size and access. Intelligent Disk Subsystems: Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems, Availability of disk subsystems.

10 Hours

MODULE II

I/O Techniques: The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage. Network Attached Storage: The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.

10 Hours

MODULE III

Storage Virtualization: Definition of Storage virtualization ; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network.

10 Hours

MODULE IV

SAN Architecture and Hardware devices: Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective. Software Components of SAN: The switch's Operating system; Device Drivers; Supporting the switch's components; Configuration options for SANs.

10 Hours

MODULE V

Management of Storage Network: System Management, Requirement of management System, Support by Management System, Management Interface, Standardized Mechanisms, Property Mechanisms, In-band Management, Use of SNMP, CIM and WBEM, Storage Management Initiative Specification (SMI-S), CMIP and DMI, Optional Aspects of the Management of Storage Networks, Summary

10 Hours

COURSE OUTCOMES:

Students will be able to:

- Identify the need for performance evaluation and the metrics used for it
- Have Knowledge on various RAID levels.
- Apply the techniques used for data maintenance.
- Develop techniques for evaluating policies for LUN masking, file systems.

TEXT BOOK:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2013.

REFERENCE BOOKS:

1. Robert Spalding: "Storage Networks The Complete Reference", Tata McGraw-Hill, 2011.
2. Marc Farley: Storage Networking Fundamentals – An Introduction to

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Dept. of Computer Science and Engineering

encryption/ decryption, security of Elliptic curve cryptography, Pseudorandom number generation based on an asymmetric cipher, PRNG based on RSA.

10 Hours

MODULE III

Key Management and Distribution: Symmetric key distribution using Symmetric encryption, A key distribution scenario, Hierarchical key control, session key lifetime, a transparent key control scheme, Decentralized key control, controlling key usage, Symmetric key distribution using asymmetric encryption, simple secret key distribution, secret key distribution with confidentiality and authentication, A hybrid scheme, distribution of public keys, public announcement of public keys, publicly available directory, public key authority, public keys certificates, X-509 certificates. Certificates, X-509 version 3, public key infrastructure .User Authentication: Remote user Authentication principles, Mutual Authentication, one way Authentication, remote user Authentication using Symmetric encryption, Mutual Authentication, one way Authentication, Kerberos, Motivation , Kerberos version 4, Kerberos version 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, one way Authentication, federated identity management, identity management, identity federation, personal identity verification.

10 Hours

MODULE IV

Wireless Network Security: Wireless security, Wireless network threats, Wireless network measures, mobile device security, security threats, mobile device security strategy, IEEE 802.11 Wireless LAN overview, the Wi-Fi alliance, IEEE 802 protocol architecture. Security, IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, Authentication phase, key management phase, protected data transfer phase, the IEEE 802.11i pseudorandom function, ..

Web Security Considerations: Web Security Threats, Web Traffic Security Approaches. Secure Sockets Layer :SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, and shake Protocol, Cryptographic Computations. Transport Layer Security: Version Number, Message Authentication Code, Pseudorandom Functions, Alert Codes, Cipher Suites, Client Certificate Types, Certificate Verify and Finished Messages, Cryptographic Computations, and Padding. HTTPS Connection Initiation, Connection Closure. Secure Shell (SSH) Transport Layer Protocol, User Authentication Protocol, Connection Protocol.

10 Hours

MODULE V

Electronic Mail Security: Pretty good privacy, notation, operational; description, S/MIME, RFC5322, Multipurpose internet mail extensions, S/ MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, Domain keys identified mail, internet mail architecture, E-Mail threats, DKIM strategy, DKIM functional flow. IP Security: IP Security overview, applications of IPsec, benefits of IPsec, Routing applications, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, Security associations, Security associations database, Security policy database, IP traffic processing, Encapsulating Security payload, ESP format, encryption and authentication algorithms, Padding, Anti replay service, transport and tunnel modes, combining security associations, authentication plus confidentiality, basic combinations of security associations, internet key exchange, key determinations protocol, header and payload formats, cryptographic suits.

10 Hours

COURSE OUTCOMES:

Students will be able to:

- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.

TEXT BOOKS:

1. William Stallings: Cryptography and Network Security, Pearson 6th edition.

REFERENCES:

1. V k Pachghare: Cryptography and Information Security. PHI Learning. ISBN 978-81-203-3521-9

Storage Devices, Subsystems, Applications, Management, and File Systems, Cisco Press, 2005.
3. Richard Barker and Paul Massiglia: "Storage Area Network Essentials A CompleteGuide to understanding and Implementing SANs", Wiley India, 2006.

Employability

SEMESTER I

ADVANCED ALGORITHMS

Course Code	: 14SCN151	Credits(L:T:P)	: 4:0:0
Core/Elective	: Elective	Type of Course	: Lecture
Total Contact Hours : 50			

COURSE OBJECTIVES :

- To learn the graph search algorithms.
- To learn the hill climbing and dynamic programming design techniques.
- To develop recursive backtracking algorithms.
- To get an awareness of NP completeness and randomized algorithms.
- To get an awareness of probabilistic and randomize algorithms.

TOPICS

MODULE I

Review of Analysis Techniques: Growth of Functions: Asymptotic notations; Standard notations and common functions; Recurrences and Solution of Recurrence equations- The substitution method, The recurrence – tree method, The master method; Amortized Analysis: Aggregate, Accounting and Potential Methods.

10 Hours

MODULE II

Graph Algorithms: Bellman - Ford Algorithm; Single source shortest paths in a DAG; Johnson's Algorithm for sparse graphs; Flow networks and Ford-Fulkerson method; Maximum bipartite matching. Polynomials and the FFT: Representation of polynomials; The DFT and FFT; Efficient implementation of FFT.

10 Hours

MODULE III

Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modular linear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization.

10 Hours

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MODULE IV

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with finite automata: Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms.

10 Hours

MODULE V

Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms.

10 Hours

COURSE OUTCOMES:

The students will be able to

- Design and apply iterative and recursive algorithms.
- Design and implement optimization algorithms in specific applications.
- Design appropriate shared objects and concurrent objects for applications.
- Get knowledge about different application based algorithm.

TEXT BOOKS:

1. T. H Cormen, C E Leiserson, R L Rivest and C Stein: Introduction to Algorithms, 3rd Edition, Prentice-Hall of India, 2010.
2. Kenneth A. Berman, Jerome L. Paul: Algorithms, Cengage Learning, 2002.

REFERENCE BOOKS:

1. Ellis Horowitz, Sartaj Sahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Universities press, 2007

SEMESTER I

COMPUTER SYSTEMS PERFORMANCE ANALYSIS

Course Code	: 14SCN152	Credits(L:T:P)	: 4:0:0
Core/Elective	: Elective	Type of Course	: Lecture
Total Contact Hours : 50			

COURSE OBJECTIVES :

- To understand the mathematical foundations needed for performance evaluation of computer systems
- To understand the metrics used for performance evaluation
- To understand the analytical modeling of computer systems
- To enable the students to develop new queuing analysis for both simple and complex systems
- To understand the concept of planning and design in computer system.

TOPICS:

MODULE I

Introduction: The art of Performance Evaluation; Common Mistakes in Performance Evaluation, A Systematic Approach to Performance Evaluation, Selecting an Evaluation Technique, Selecting Performance Metrics, Commonly used Performance Metrics, Utility Classification of Performance Metrics, Setting Performance Requirements.

10 Hours

MODULE II

Workloads, Workload Selection and Characterization: Types of Workloads, addition instructions, Instruction mixes, Kernels; Synthetic programs, Application benchmarks, Popular benchmarks. Work load Selection: Services exercised, level of detail; Representativeness; Timeliness, Other considerations in workload selection. Work load characterization Techniques: Terminology; Averaging, Specifying dispersion, Single Parameter Histograms, Multi Parameter Histograms, Principle Component Analysis, Markov Models, Clustering.

10 Hours

MODULE III

Monitors, Program Execution Monitors and Accounting Logs: Monitors: Terminology and classification; Software and hardware monitors, Software versus hardware monitors, Firmware and hybrid monitors, Distributed System

Monitors, Program Execution Monitors and Accounting Logs, Program Execution Monitors, Techniques for Improving Program Performance, Accounting Logs, Analysis and Interpretation of Accounting log data, Using accounting logs to answer commonly asked questions.

10 Hours

MODULE IV

Capacity Planning and Benchmarking: Steps in capacity planning and management; Problems in Capacity Planning; Common Mistakes in Benchmarking; Benchmarking Games; Load Drivers; Remote- Terminal Emulation; Components of an RTE; Limitations of RTEs. Experimental Design and Analysis: Introduction: Terminology, Common mistakes in experiments, Types of experimental designs, 2k Factorial Designs, Concepts, Computation of effects, Sign table method for computing effects; Allocation of variance; General 2k Factorial Designs, General full factorial designs with k factors: Model, Analysis of a General Design, Informal Methods.

10 Hours

MODULE V

Queuing Models: Introduction: Queuing Notation; Rules for all Queues; Little's Law; Types of Stochastic Process. Analysis of Single Queue: Birth-Death Processes; M/M/1 Queue; M/M/m Queue; M/M/m/B Queue with finite buffers; Results for other M/M/1 Queuing Systems. Queuing Networks: Open and Closed Queuing Networks; Product form networks, queuing Network models of Computer Systems. Operational Laws: Utilization Law; Forced Flow Law; Little's Law; General Response Time Law; Interactive Response Time Law; Bottleneck Analysis; Mean Value Analysis and Related Techniques; Analysis of Open Queuing Networks; Mean Value Analysis; Approximate MVA; Balanced Job Bounds; Convolution Algorithm, Distribution of Jobs in a System, Convolution Algorithm for Computing G(N), Computing Performance using G(N), Timesharing Systems, Hierarchical Decomposition of Large Queuing Networks: Load Dependent Service Centers, Hierarchical Decomposition, Limitations of Queuing Theory.

10 Hours

COURSE OUTCOMES :

Students will be able to:

- Identify the need for performance evaluation and the metrics used for it
- Define Little'e law and other operational laws
- Apply the operational laws to open and closed systems
- Use discrete-time and continuous-time Markov chains to model real world systems

- Develop analytical techniques for evaluating scheduling policies

TEXT BOOK:

1. Raj Jain: The Art of Computer Systems Performance Analysis, John Wiley and Sons, 2013.

REFERENCE BOOKS:

1. Paul J Fortier, Howard E Michel: computer Systems Performance Evaluation and prediction, Elsevier, 2003.
2. Trivedi K S: Probability and Statistics with Reliability, Queuing and Computer Science Applications, 2nd Edition, Wiley India, 2001.

Skill development

SEMESTER I

MULTI-CORE ARCHITECTURE AND PROGRAMMING

Course Code	: 14SCN153	Credits(L:T:P): 4:0:0
Core/Elective	: Elective	Type of Course: Lecture
Total Contact Hours	: 50	

COURSE OBJECTIVES :

- To understand the recent trends in the field of Computer Architecture and identify performance related parameters
- To expose the students to the problems related to multiprocessing
- To understand the different types of multi core architectures
- To expose the students to warehouse-scale and embedded architectures

TOPICS

MODULE I

Introduction to Multi-core Architecture: Motivation for Concurrency in software, Parallel Computing Platforms, Parallel Computing in Microprocessors, Differentiating Multi-core Architectures from Hyper- Threading Technology, Multi-threading on Single-Core versus Multi-Core Platforms Understanding Performance, Amdahl's Law, Growing Returns: Gustafson's Law. System Overview of Threading: Defining Threads, System View of Threads, Threading above the Operating System, Threads inside the OS, Threads inside the Hardware, What Happens When a Thread Is Created, Application Programming Models and Threading, Virtual Environment: VMs and Platforms, Runtime Virtualization, System Virtualization.

10 Hours

MODULE II

Fundamental Concepts of Parallel Programming: Designing for Threads, Task Decomposition, Data Decomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'll Face, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the Error Diffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives.

10 Hours

MODULE III

Threading and Parallel Programming Constructs: Synchronization, Critical Sections, Deadlock, Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control- based Concepts, Fence, Barrier,

Implementation-dependent Threading Features. Threading APIs : Threading APIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft. NET Framework, Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, Creating Threads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking.

10 Hours

MODULE IV

OpenMP: A Portable Solution for Threading: Challenges in Threading a Loop, Loop-carried Dependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning, Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, Performance-oriented Programming, Using Barrier and No wait, Interleaving Single-thread and Multi-thread Execution, Data Copy-in and Copy-out, Protecting Updates of Shared Variables, Intel Task queuing Extension to OpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging, performance.

10 Hours

MODULE V

Solutions to Common Parallel Programming Problems: Too Many Threads, Data Races, Deadlocks, and Live Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily Contended Locks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem, Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in the Cache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency, Current IA-32 Architecture, Itanium Architecture, High-level Languages, Avoiding Pipeline Stalls on IA-32,Data Organization for High Performance.

10 Hours

COURSE OUTCOMES :

Students will be able to:

- Identify the limitations of ILP and the need for multi-core architectures.
- Point out the salient features of different multi-core architectures and how they exploit parallelism.
- Critically analyze the different types of inter connection networks.
- Knowledge on architecture of GPUs, warehouse-scale computers and embedded processors.

TEXT BOOK :

1. Multicore Programming , Increased Performance through Software Multi-threading by Shameem Akhter and Jason Roberts , Intel Press , 2006.

Employability

SEMESTER I

SOFT COMPUTING

Course Code : 14SCN154 **Credits(L:T:P): 4:0:0**
Core/Elective : **Elective** **Type of Course: Lecture**
Total Contact Hours : 50

Course Objectives:

- To learn the key aspects of Soft computing
- To know about the components and building block hypothesis of Genetic algorithm.
- To understand the features of neural network and its applications
- To study the fuzzy logic components
- To gain insight onto Neuro Fuzzy modeling and control.
- To gain knowledge in machine learning through Support vector machines.

Topics:

MODULE I

Introduction to Soft computing, Neural networks, Fuzzy logic, Genetic algorithms, Hybrid systems and its applications. Fundamental concept of ANN, Evolution, basic Model of ANN, Terminologies used in ANN, MP model, Hebb model.

10 Hours

MODULE II

Perceptron Network, Adaptive linear neuron, Multiple adaptive linear neurons, Back propogation Network (Theory, Architecture, Algorithm for training, learning factors, testing and applications of all the above NN models)

10 Hours

MODULE III

Introduction to classical sets and fuzzy sets, Classical relations and fuzzy relations, Membership functions,

10 Hours

MODULE IV

Defuzzification, Fuzzy decision making, and applications

10 Hours

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Dept. of Computer Science and Engineering

MODULE V

Genetic algorithms: Introduction, Basic operations, Traditional algorithms, Simple GA General genetic algorithms, The schema theorem, Genetic programming, applications

10 Hours

Course Outcomes:

The student will be able to:

- Implement machine learning through neural networks.
- Write Genetic Algorithm to solve the optimization problem
- Develop a Fuzzy expert system.
- Model Neuro Fuzzy system for clustering and classification.

TEXT BOOK:

1. Principles of Soft computing, Shivanandam, Deepa S. N Wiley India, Jun-2007 (Chapters 1, 2, 3(Upto 3.5), 7, 8, 9, 10, 13, 15 (upto 15.6 & 15.9,15,10)

REFERENCE BOOKS:

1. Neuro-fuzzy and soft computing, J.S.R. JANG, C.T. SUN, E. MIZUTANI, PHI (EEE edition) ISBN: 978-81-203-2243-1

SEMESTER I
INFORMATION AND NETWORK SECURITY LAB

Course Code	**: 14SCN16**	**Credits(02)(L:T:P): 0:0:3**
Core/Elective	**: Core**	**Type of Course: Practical**
Total Contact Hours : 42		

Course Objectives:

- To understand the fundamentals of Cryptography through practical implementation.
- To implement standard algorithms used to provide confidentiality, integrity and authenticity.
- To understand the various key distribution and management schemes.
- To understand how to use cutting edge simulation tools
- To design security applications in the field of Information technology.

LABORATORY WORK :

Note: Use C/C++/Java or equivalent tool to implement the following experiment

1. Consider a file with composite data, substitute the content and transpose the ciphers.
2. Consider an alphanumeric data, encrypt and Decrypt the data using advanced encryption standards and verify for the correctness.
3. Apply the RSA algorithm on a text file to produce cipher text file.
4. Develop a mechanism to setup a security channel using Diffie-Hellman Key Exchange between client and server
5. Implementation of Message Authentication Code using cryptography VMAC function.
6. Implement secure hash algorithm for Data Integrity. Implement MD5 and SHA-1 algorithm, which accepts a string input, and produce a fixed size number - 128 bits for MD5; 160 bits for SHA-1, this number is a hash of the input. Show that a small change in the input results in a substantial change in the output
7. Using any simulation tool: demonstrate packet filtering firewalls, create the ACL, create VLAN [Subnetting].
8. Develop a mechanism to setup(configure) a port scanner and identify the intrusion.

Course Outcomes:
Students will be able to:

- Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- Identify the security issues in the network and resolve it.
- Evaluate security mechanisms using rigorous approaches, including theoretical.

Employability

SEMESTER II

MULTIMEDIA COMMUNICATIONS

Course Code : 14SCN21 Credits(L:T:P): 3:0:1
Core/Elective : Core Type of Course: Lecture and practical
Total Contact Hours : 50

Course Objectives:

- To understand the Multimedia Communication Models
- To study the Multimedia Transport in Wireless Networks
- To solve the Security issues in multimedia networks
- To explore real-time multimedia network applications.
- To explore different network layer based application.

TOPICS

MODULE I

Introduction to Multimedia Communications: Introduction, Human communication model, Evolution and convergence, Technology framework, Standardization framework.

10 Hours

MODULE II

Framework for Multimedia Standardization: Introduction, Standardization activities, Standards to build a new global information infrastructure, Standardization processes on multimedia communications, ITU-T mediacom2004 framework for multimedia, ISO/IEC MPEG-21 multimedia framework, IETF multimedia Internet standards.

10 Hours

MODULE III

Application Layer: Introduction, ITU applications, MPEG applications, Mobile servers and applications, Universal multimedia access.

10 Hours

MODULE IV

Middleware Layer: Introduction to middleware for multimedia, Media coding, Media Streaming, Infrastructure for multimedia content distribution.

10 Hours

MODULE V

Network Layer: Introduction, QoS in Network Multimedia Systems.

10 Hours

LABORATORY WORK :

The following experiments should be practiced (Tools such as HTML/ Frontpage/Dreamweaver/ equivalent, Multimedia application enabling software ,System software support for multimedia, Performance measurement tools for multimedia ,Multimedia authoring tools, Web tools and applications)

1. Audio and video editing
2. Image editing
3. 2D and 3D animation.

The case studies are:

- Video on-demand
- Interactive TV
- Home shopping
- Remote home care
- Electronic album
- Personalized electronic journals.

COURSE OUTCOMES:

Students will be able to:

- Deploy the right multimedia communication models.
- Apply QoS to multimedia network applications with efficient routing techniques.
- Solve the security threats in the multimedia networks.
- Develop the real-time multimedia network applications.

TEXT BOOKS:

1. K.R. Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic: Introduction to Multimedia Communications – Applications, Middleware, Networking, Wiley India, 2006.

REFERENCE BOOKS:

1. Fred Halsall: Multimedia Communications – Applications, Networks, Protocols, and Standards, Pearson, 2001.
2. Nalin K Sharad: Multimedia information Networking, PHI, 2002.

Employability

SEMESTER II

DISTRIBUTED COMPUTING

Course Code	: 14SCN22	Credits(L:T:P)	: 4:0:0
Core/Elective	: Core	Type of Course	: Lecture
Total Contact Hours	: 50		

Course Objectives :

- To learn Basic Concepts of DSM, Hardware DSM
- To understand File Sharing, DFS Implementation, Replication in DFS,
- To understand the concepts of Cryptanalysis, Secure channels, Access control.
- To understand some of the security concepts in distributed computing.

TOPICS

MODULE I

Distributed System Management: Introduction, Resource management, Task Assignment Approach, Load-Balancing Approach, Load-Sharing Approach, Process management in a Distributed Environment, Process Migration, Threads, Fault Tolerance.

10 hours

MODULE II

Distributed Shared Memory : Introduction, Basic Concepts of DSM, Hardware DSM, Design Issue in DSM Systems, Issue in Implementing DSM Systems, Heterogeneous and Other DSM Systems, Case Studies.

10 hours

MODULE III

Distributed File System: Introduction to DFS, File Models, Distributed File System Design, Semantics of File Sharing, DFS Implementation, File Caching in DFS, Replication in DFS, Case studies. Naming: Introduction, Desirable features of a good naming system, Basic concepts, System-oriented names, Object-locating mechanisms, Issues in designing human-oriented names, Name caches, Naming and security, Case study: Domain name service.

10 hours

MODULE IV

Security in Distributed Systems: Introduction, Cryptography, Secure channels, Access control, Security Management, Case studies.

10 hours

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MODULE V

Real-Time Distributed Operating Systems: Introduction, Design issues in real-time distributed systems, Real-time communication, Real-time scheduling, Case study: Real-time communication in MARS. Emerging Trends in distributed Computing: Introduction to emerging trends, Grid Computing, SOA, Cloud computing, the future of emerging Trends.

10 hours

COURSE OUTCOMES:

The student will be able to

- Realize shared memory concept.
- Realize Advantages of DFS.
- Implement mechanisms to manage security in DS

TEXT BOOK.

1. Sunitha Mahajan, Seema Shah: Distributing Computing, Published by Oxford University press 2010

Employability

SEMESTER II

NETWORK MANAGEMENT

Course Code : 14SCN23 **Credits(L:T:P): 3:0:1**
Core/Elective : Core **Type of Course: Lecture and practical**
Total Contact Hours : 50

COURSE OBJECTIVES :

- To understand the need for interoperable network management.
- To learn to the concepts and architecture behind standards based network management.
- To understand the concepts and terminology associated with SNMP and TMN.
- To understand network management as a typical distributed application

TOPICS

MODULE I

Introduction: Analogy of Telephone Network Management, Data and Telecommunication Network Distributed computing Environments, TCP/IP-Based Networks: The Internet and Intranets, Communications Protocols and Standards- Communication Architectures, Protocol Layers and Services; Case Histories of Networking and Management – The Importance of topology , Filtering Does Not Reduce Load on Node, Some Common Network Problems; Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions- Goal of Network Management, Network Provisioning, Network Operations and the NOC, Network Installation and Maintenance; Network and System Management, Network Management System platform, Current Status and Future of Network Management.

10 Hours

MODULE II

Basic Foundations: Standards, Models, and Language: Network Management Standards, Network Management Model, Organization Model, Information Model – Management Information Trees, Managed Object Perspectives, Communication Model; ASN.1- Terminology, Symbols, and Conventions, Objects and Data Types, Object Names, An Example of ASN.1 from ISO 8824; Encoding Structure; Macros, Functional Model.

10 Hours

MODULE III

SNMPv1 Network Management: Managed Network: The History of SNMP Management, Internet Organizations and standards, Internet Documents, The SNMP Model, The Organization Model, System Overview. The Information Model – Introduction, The Structure of Management Information, Managed Objects, Management Information Base. The SNMP Communication Model -- The SNMP Architecture, Administrative Model, SNMP Specifications, SNMP Operations. SNMP MIB Group, Functional Model

SNMP Management – RMON: Remote Monitoring, RMON SMI and MIB, RMON11- RMON1 Textual Conventions, RMON1 Groups and Functions, Relationship Between Control and Data Tables, RMON1 Common and Ethernet Groups, RMON Token Ring Extension Groups, RMON2 – The RMON2 Management Information Base, RMON2 Conformance Specifications.

10 Hours

MODULE IV

Broadband Network Management: Broadband Access Networks and Technologies: Broadband Access Networks, Broadband Access Technology; HFCT Technology: The Broadband LAN, The Cable Modem, The Cable Modem Termination-System, The HFC Plant, The RF Spectrum for Cable Modem; Data Over Cable, Reference Architecture; HFC Management – Cable Modem and CMTS Management, HFC Link Management, RF Spectrum Management, DSL Technology; Asymmetric Digital Subscriber Line Technology – Role of the ADSL Access Network in an Overall Network, ADSL Architecture, ADSL Channeling Schemes, ADSL Encoding Schemes; ADSL Management – ADSL Network Management Elements, ADSL Configuration Management, ADSL Fault Management, ADSL Performance Management, SNMP-Based ADSL Line MIB, MIB Integration with Interfaces Groups in MIB-2, ADSL Configuration Profiles.

10 Hours

MODULE V

Network Management Applications: Configuration Management- Network Provisioning, Inventory Management, Network Topology, Fault Management- Fault Detection, Fault Location and Isolation Techniques, Performance Management – Performance Metrics, Data Monitoring, Problem Isolation, Performance Statistics; Event Correlation Techniques – Rule-Based Reasoning, Model-Based Reasoning, Case-Based Reasoning, Codebook correlation Model, State Transition Graph Model, Finite State Machine Model,

Security Management – Policies and Procedures. Security Breaches and the Resources Needed to Prevent Them, Firewalls, Cryptography, Authentication and Authorization, Client/Server Authentication Systems, Messages Transfer Security, Protection of Networks from Virus Attacks, Accounting Management, Report Management, Policy- Based Management, Service Level Management.

10 Hours

LABORATORY WORK:

1. Capture packets transferred while browsing a selected website (e.g. a page from the course website, a search engine home page). Investigate the protocols used in each packet, the values of the header fields and the packet sizes.
2. Explore at least the following features of Wireshark: filters, Flow Graphs (TCP), statistics, protocol hierarchies.
3. Create several example files for your Apache web server to serve. Configure your web server, and then ask a friend to test your web server by accessing the files. Capture the packets and observe the log file.
4. Configure authentication for a specific directory on your web server. Test, captured packets and observe the log file. 5. Login to another computer in the lab, capture and investigate the data exchanged.
6. Trace the path between several pairs of source/destination nodes. 7. Create fire wall rule(s) that will drop TCP packets destined to a specific computer on the lab network (e.g. yours neighbors computer).
8. Using the supplied client/server sockets programs, implement a third proxy server.

Note: NS2 or equivalent tool to be used.

Course Outcomes:

Upon completion of this course, the students will be able to

- Analyze the issues and challenges pertaining to management of emerging network technologies such as wired/wireless networks and high-speed internets.
- Apply network management standards to manage practical networks.
- Formulate possible approaches for managing OSI network model.
- Use on SNMP for managing the network
- Use RMON for monitoring the behavior of the network
- Identify the various components of network and formulate the scheme for the managing them

TEXT BOOKS:

1. Mani Subramanian: Network Management- Principles and Practice, 2nd Pearson Education, 2010.

REFERENCE BOOKS:

1. J. Richard Burke: Network management Concepts and Practices: a Hands-On Approach, PHI, 2008.

Employability

12

SEMESTER II

SWITCHING & STATISTICAL MULTIPLEXING IN TELECOMMUNICATIONS

Course Code	**: 14SCN24**	**Credits(L:T:P): 4:0:0**
Core/Elective	**: Core**	**Type of Course: Lecture**
Total Contact Hours : 50		

Course Objectives:

- To understand Switching and multiplexing.
- To understand the transmission technology.
- To understand the transmission control.
- To understand basic knowledge on telecommunication.

Topics:

MODULE I

Introduction: Evolution of Telecommunication, Simple Telephone Communication, Basics of a Switching System, Manual Switching System, Major Telecommunication Networks. Why Digital: Advantages of Digital Voice Networks, Digital Signal Processing, Disadvantages of Digital Voice Networks.

10 Hours

MODULE II

Switching: Crossbar Switching, Principles of Common Control, Touch Tone Dial Telephone, Principles of Crossbar Switching, Crossbar Switch Configurations, Crosspoint Technology, Crossbar Exchange Organization.

10 Hours

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MODULE III

Electronic Space Division Switching: Stored Program Control, Centralized SPC, Distributed SPC, Software Architecture, Application Software, Enhanced Services, Two-stage, Three-stage and n-stage Networks. Digital Transmission and Multiplexing: Sampling, Quantization and Binary Coding, Quantization Noise, Companding, Differential Coding, Vocoders, Pulse Transmission, Line Coding, Time Division Multiplexing.

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10 Hours

MODULE IV

Time Division Switching: Basic Division Space and Time Switching, Time Multiplexed Space and Time Switching, Combination Switching, Three-stage and n-stage Combination Switching.

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10 Hours

MODULE V

Traffic Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking Models and Loss Estimates, Delay Systems.

10 Hours

Course Outcomes:

The student will be able to:

- Gain the knowledge about switching and multiplexing
- Gain the knowledge about telecommunication.
- Learn transmission control in telecommunication.

TEXT BOOKS:

1. Thiagarajan Viswanathan: Telecommunication Switching Systems and Networks, PHI, 1992.
2. John.C.Bellamy: Digital Telephony, 3rd Edition, John Wiley and Sons Inc., 2002.

Employability

SEMESTER II

CLOUD COMPUTING

Course Code	**: 14SCN251**	**Credits(L:T:P): 4:0:0**
Core/Elective	**: Elective**	**Type of Course: Lecture**
Total Contact Hours : 50		

COURSE OBJECTIVES :

- To learn how to use Cloud Services.
- To gain knowledge Virtualization
- To gain knowledge Task Scheduling algorithms.
- Apply Map-Reduce concept to applications.
- To build Private Cloud.
- To gain knowledge in cloud resource virtualization and scheduling.

TOPICS:

MODULE I

Introduction, Cloud Infrastructure : Cloud computing, Cloud computing delivery models and services, Ethical issues, Cloud vulnerabilities, Cloud computing at Amazon, Cloud computing the Google perspective, Microsoft Windows Azure and online services, Open-source software platforms for private clouds, Cloud storage diversity and vendor lock-in, Energy use and ecological impact, Service level agreements, User experience and software licensing. Exercises and problems.

10 Hours

MODULE II

Cloud Computing: Application Paradigms : Challenges of cloud computing, Architectural styles of cloud computing, Workflows: Coordination of multiple activities, Coordination based on a state machine model: The Zookeeper, The Map Reduce programming model, A case study: The GrepTheWeb application , Cloud for science and engineering, High-performance computing on a cloud, Cloud computing for Biology research, Social computing, digital content and cloud computing.

10 Hours

MODULE III

Cloud Resource Virtualization : Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and paravirtualization, Hardware support for

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virtualization, Case Study:Xen a VMM based paravirtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization, Exercises and problems.

10 Hours

MODULE IV

Cloud Resource Management and Scheduling : Policies and mechanisms for resource management, Application of control theory to task scheduling on a cloud, Stability of a two-level resource allocation architecture, Feedback control based on dynamic thresholds, Coordination of specialized autonomic performance managers, A utility-based model for cloud-based Web services, Resourcing bundling: Combinatorial auctions for cloud resources, Scheduling algorithms for computing clouds, Fair queuing, Start-time fair queuing, Borrowed virtual time, Cloud scheduling subject to deadlines, Scheduling Map Reduce applications subject to deadlines, Resource management and dynamic scaling, Exercises and problems.

10 Hours

MODULE V

Cloud Security, Cloud Application Development : Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor, Amazon web services: EC2 instances, Connecting clients to cloud instances through firewalls, Security rules for application and transport layer protocols in EC2, How to launch an EC2 Linux instance and connect to it, How to use S3 in java, Cloud-based simulation of a distributed trust algorithm, A trust management service, A cloud service for adaptive data streaming, Cloud based optimal FPGA synthesis .Exercises and problems.

10 Hours

Course Outcomes:

The student will be able to:

- Demonstrate simple Cloud Applications
- Apply resource allocation, scheduling algorithms.
- Implement Map-Reduce concept.
- Create virtual machines from available physical resources.
- Setup a private cloud.

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TEXT BOOK:

1. Dan C Marinescu: Cloud Computing Theory and Practice. Elsevier(MK) 2013.

REFERENCES:

1. Rajkumar Buyya , James Broberg, Andrzej Goscinski: Cloud Computing Principles and Paradigms, Willey 2014.
2. John W Rittinghouse, James F Ransome:Cloud Computing Implementation, Management and Security, CRC Press 2013.

Employability

SEMESTER II

WIRELESS SENSOR NETWORKS

Course Code	: 14SCN252	Credits(L:T:P): 4:0:0
Core/Elective	: Elective	Type of Course: Lecture
Total Contact Hours : 50		

COURSE OBJECTIVES :

- Architect sensor networks for various application setups.
- Explore the design space and conduct trade-off analysis between performance and resources.
- Devise appropriate data dissemination protocols and model links cost.
- Determine suitable medium access protocols and radio hardware.
- Prototype sensor networks using commercial components.
- Provision quality of service, fault-tolerance, security and other dependability requirements while coping with resource constraints.

TOPICS:

MODULE I

Introduction, Overview and Applications of Wireless Sensor Networks : Introduction, Basic overview of the Technology, Applications of Wireless Sensor Networks: Introduction, Background, Range of Applications, Examples of Category 2 WSN Applications, Examples of Category 1 WSN Applications, Another Taxonomy of WSN Technology (Chapter 1: 1.1, 1.2, Chapter2: 2. 1-2.6)

10 Hours

MODULE II

Basic Wireless Sensor Technology and Systems: Introduction, Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends, Wireless Transmission Technology and Systems: Introduction, Radio Technology Primer, Available Wireless Technologies (Chapter3: 3.1-3.5, Chapter 4: 4.1-4.3)

10 Hours

MODULE III

MAC and Routing Protocols for Wireless Sensor Networks: Introduction, Background, Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC case Study, IEEE 802.15.4 LR-WPANs Standard Case Study. Routing Protocols for Wireless Sensor Networks: Introduction, Background, Data Dissemination and Gathering, Routing Challenges and Design Issues in WSNs, Routing Strategies in WSNs. (Chapter 5: 5.1-5.6, Chapter 6: 6.1-6.5)

10 Hours

MODULE IV

Transport Control and Middleware for Wireless Sensor Networks : Traditional Transport Control Protocols, Transport Protocol Design Issues, Examples of Existing Transport Control Protocols, Performance of Transport Control Protocols. Middleware for Wireless Sensor Networks: Introduction, WSN Middleware Principles, Middleware Architecture, Existing Middleware. (Chapter 7: 7.1-7.4, Chapter 8: 8.1-8.4)

10 Hours

MODULE V

Network Management and Operating System for Wireless Sensor Networks: Introduction, Network Management Requirements, Traditional Network Management Models, Network Management Design Issues. Operating Systems for Wireless Sensor Networks: Introduction, Operating System Design Issues, Examples of Operating Systems. (Chapter 9: 9.1-9.5, Chapter 10: 10.1-10.3)

10 Hours

COURSE OUTCOMES :

The student will be able to:

- Develop applications of wireless sensor actuator networks
- Implement the elements of distributed computing and network protocol .
- Explore various hardware, software platforms that exist for sensor networks

TEXT BOOKS:

1. KAZEM SOHRABY, DANIEL MINOLI, TAIEB ZNATI, "Wireless Sensor Networks: Technology, Protocols and Applications:, WILEY , Second Edition (Indian) , 2014

REFERENCE BOOKS:

1. Ian F. Akyildiz, Mehmet Can Vuran "Wireless Sensor Networks", Wiley 2010
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.

Employability

SEMESTER II

OPTICAL NETWORKS

Course Code	: 14SCN253	Credits(L:T:P)	: 4:0:0
Core/Elective	: Elective	Type of Course	: Lecture
Total Contact Hours : 50			

Course Objectives:

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
- To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes
- To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration
- To learn the fiber optical network components, variety of networking aspects, FDDI, SONET/SDH and operational principles WDM
- To acquire knowledge about fault and congestion management.

Topics

MODULE I

Client Layers of the Optical Layer: SONET/SDH: Multiplexing, CAT and LCAS, Sonnet/SDH Layers, SONET Frame Structure, SONET/SDH Physical Layer , Elements of a SONET/SDH Infrastructure, Optical Transport Network: Hierarchy, Frame Structure, Multiplexing, Generic Framing Procedure Ethernet: Frame Structure, Switches, Ethernet Physical Layer, Carrier Transport IP: Routing and Forwarding, Quality of Service. Multiprotocol Label Switching: Labels and Forwarding, Quality of Service, Signaling and Routing, Carrier Transport, Resilient Packet Ring: Quality of Service, Node Structure, Fairness Storage-Area Networks: Fiber Channel.

10 Hours

MODULE II

WDM Network Elements: Optical Line Terminals, Optical Line Amplifiers, Optical Add/Drop Multiplexers: OADM Architectures, Reconfigurable OADMs Optical Cross connects: All-Optical OXC Configurations.

10 Hours

MODULE III

Control and Management Network Management Functions: Management Framework, Information Model, Management Protocols. Optical Layer Services and Interfacing, Layers within the Optical Layer, Multivendor Interoperability. Performance and Fault Management: The Impact of Transparency, BER Measurement, Optical Trace, Alarm Management, Data Communication Network (DCN) and Signaling, Policing, Optical Layer Overhead, Client Layers. Configuration Management: Equipment Management, Connection Management, Adaptation Management. Optical Safety: Open Fiber Control Protocol

10 Hours

MODULE IV

Protection in SONET/SDH: Point-to-Point Links, Self-Healing Rings, Unidirectional Line-Switched Rings, Bidirectional Line-Switched Rings, Ring Interconnection and Dual Homing. Protection in the Client Layer: Protection in Resilient Packet Rings, Protection in Ethernet, Protection in IP, Protection in MPLS. Why Optical Layer Protection: Service Classes Based on Protection. Optical Layer Protection Schemes: 1+1 OMS Protection, 1:1 OMS Protection, OMS-DPRing, OMS-SPRing, 1:N Transponder Protection, 1+1 OCh Dedicated Protection, OCh-SPRing, OCH-Mesh Protection, GMPLS Protection, Interworking between Layers.

10 Hours

MODULE V

WDM Network Design: Cost Trade-OFFS: A Detailed Ring Network Example LTD and RWA Problems, Light path Topology Design, Routing and Wavelength Assignment, Wavelength Conversion. Dimensioning Wavelength-Routing Networks, Statistical Dimensioning Models: First-Passage Model, Blocking Model, Maximum Load Dimensioning Models: Offline Light path Requests, Online RWA in Rings.

10 Hours

COURSE OUTCOMES :

The student will be able to:

- Design a system, component or process as per needs and specification.
- Gain knowledge on optical network architectures ranging from optical access networks to backbone optical transport networks.
- Gain the knowledge on methodologies of optical network design optimization;
- Explore techniques of optical network survivability.
- Solve the Problems in the discipline of optical networks.

TEXT BOOKS:

1. Optical Networks by Rajeev Ramaswamy, Kumar N Sivarajan, Galen H Sasaki, Elsevier Publication 3rd Edition, 2009.

REFERENCES:

1. Uyless Black, Optical Networks-Third generation transport system: Pearson 2013.

Employability

SEMESTER II

ADVANCES IN VLSI DESIGN AND ALGORITHMS

Course Code	: 14SCN254	Credits(L:T:P): 4:0:0
Core/Elective	: Elective	Type of Course: Lecture
Total Contact Hours : 50		

Course Objectives:

- Able to understand the fundamentals of CMOS VLSI and associated technologies.
- Able to solve problems in the design of CMOS logic circuits, with particular reference to speed and power consumption.
- Able to appreciate the design process in VLSI, GALS.
- Able to explain basic operation principles of diodes and MOS FPGAs; PLA.
- Able to design the fundamental blocks of a VLSI circuits, both by circuit schematic and physical layout

TOPICS:

MODULE I

Introduction to Digital Systems and VLSI: Why Design Integrated Circuits? Integrated Circuits manufacturing; Integrated Circuit Design Techniques; IP-Based Design.

Fabrication and Devices: Introduction; Fabrication processes; Fabrication theory and practice; Reliability.

10 Hours

MODULE II

Sequential Machines: Introduction; Latches and Flip-flops; Sequential systems and clocking disciplines; Performance analysis; Clock generators; Sequential systems design, Power optimization, Design validation, Sequential testing.

10 Hours

MODULE III

Subsystem Design: Introduction; Combinational shifters; Adders; ALUs; Multipliers; High-density memory; Image sensors; FPGAs; PLA; Buses and networks on chips; Data paths; Subsystems as IP.

10 Hours

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MODULE IV

Architecture Design: Introduction; Hardware description languages; Register Transfer design; Pipelining: High-level synthesis; Architecture for low power; GALS systems; Architecture testing; IP components; Design methodologies; Multiprocessor system-on-Chip design.

10 Hours

MODULE V

Simulations: General remarks; Gate-level modeling and simulations; Switch-level modeling and simulation.

10 Hours

Course Outcomes:

The student will be able to:

- Clear understanding of important concepts in CMOS technology and fabrication that affect design.
- Apply two-level and multi-level logic minimization techniques to the given Boolean logic function.
- Design and develop Layout a gate in CMOS VLSI technology.

TEXT BOOKS:

1. Wayne Wolf: "Modern VLSI design", 4th Edition, PHI Learning, 2007.
2. Sabih H Gerez: "Algorithms for VLSI Design Automation", Wiley India, 2007.

SEMESTER II
DISTRIBUTED COMPUTING LAB

Course Code	: 14SCN26	Credits(02)(L:T:P): 0:0:3
Core/Elective	: Core	Type of Course: Practical
Total Contact Hours	: 42	

Course Objectives :

- To understand the main ideas and concepts on web services.
- Studying and working on a related topic of internet applications such as information hiding, system security and E-learning.
- To understand the concepts of UDDI, SOAP, JMS remote procedure calls.

LIST OF EXPERIMENTS:

Note: Use appropriate tools/language to implement the following experiment:

1. Design and implement client server application using RMI (Remote Method Invocation) to invoke a service to calculate the income tax.
2. Design and implement EJB (Entity Java Beans) session bean business logic to calculate income tax and invoke the service using stub, i.e., client side proxy object.
3. Design and implement an EJB entity bean to persist the client submitted data into an enterprise information system.
4. Design and implement an offline database communication system using JMS (Java Message Service) to service the client request.
5. Design and implement the client code to call the Micro soft service like free service from UDDI (Universal Description Discovery Protocol).
6. Design and implement business logic and bind it as service using SOAP (Simple Object Access Protocol), also implement client to call service.

NOTE: Use EJB 3.X or any equivalent tool.

COURSE OUTCOMES:

The student will be able to

- Develop and debug RPC based client-Server programs in UNIX.
- Realize the partial implementation of UDDI, SOAP, JMS in Web applications.

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SEMESTER IV

CLIENT-SERVER PROGRAMMING

Course Code	: 14SCN41	Credits(L:T:P): 3:0:1
Core/Elective	: Core	Type of Course: Lecture and practical
Total Contact Hours : 50		

COURSE OBJECTIVES :

- To understand Client-Server software, Context Switching and Protocol Software, I/o.
- To understand System Calls, Basic I/O Functions available in UNIX
- To understand the Socket interface, TCP, UDP un detail.
- Various client software applications and their issues.
- To understand the concept of Socket interface in client server programming.

TOPICS:

MODULE I

The Client Server Model and Software Design: Introduction, Motivation, Terminology and Concepts Concurrent Processing in Client-Server software: Introduction, Concurrency in Networks, Concurrency in Servers, Terminology and Concepts, An example of Concurrent Process Creation, Executing New Code, Context Switching and Protocol Software Design, Concurrency and Asynchronous I/O. Program Interface to Protocols: Introduction, Loosely Specified Protocol Software Interface, Interface Functionality, Conceptual Interface Specification, System Calls, Two Basic Approaches to Network Communication, The Basic I/O Functions available in UNIX, Using UNIX I/O with TCP/IP.

10 Hours

MODULE II

The Socket Interface: Introduction, Berkley Sockets, Specifying a Protocol Interface, The Socket Abstraction, Specifying an End Point Address, A Generic Address Structure, Major System Calls used with Sockets, Utility Routines for Integer Conversion, Using Socket Calls in a Program, Symbolic Constants for Socket Call Parameters. Algorithms and Issues in Client Software Design: Introduction, Learning Algorithms instead of Details, Client Architecture, Identifying the Location of a Server, Parsing an Address Argument, Looking up a Domain Name, Looking up a well-known Port by Name, Port Numbers and Network Byte Order, Looking up a Protocol by Name, The TCP Client Algorithm, Allocating a Socket, Choosing a Local Protocol Port Number, A fundamental Problem in choosing a Local IP Address, Connecting a TCP Socket to a Server, Communicating with the Server using TCP, Reading a response from a TCP Connection, Closing a TCP Connection, Programming a UDP Client, Connected and Unconnected UDP Socket, Using Connect with UDP, Communicating with a Server using UDP, Closing a Socket that uses UDP, Partial Close for UDP, A Warning about UDP Unreliability.

10 Hours

MODULE III

Example Client Software: Introduction, The Importance of Small Examples, Hiding Details, An Example Procedure Library for Client Programs, Implementation of Connect TCP, Implementation of Connect UDP, A Procedure that Forms Connections, Using the Example Library, The DAYTIME Service, Implementation of a TCP Client for DAYTIME, Reading from a TCP Connection, The Time Service, Accessing the TIME Service, Accurate Times and Network Delays, A UDP Client for the TIME Service. The ECHO Service, A TCP Client for the ECHO Service. A UDP Client for the ECHO Service.

10 Hours

MODULE IV

Algorithms and Issues in Server Software Design: Introduction, The Conceptual Server Algorithm, Concurrent Vs Iterative Servers, Connection-Oriented Vs Connectionless Access, Connection-Oriented Servers, Connectionless Servers, Failure, Reliability and Statelessness, Optimizing Stateless Servers, Four Basic Types of Servers, Request Processing Time, Iterative Server Algorithms, An Iterative Connection-Oriented Server Algorithm, Binding to a Well Known Address using INADDR_ANY, Placing the Socket in Passive Mode, Accepting Connections and using them. An Iterative Connectionless Server Algorithm, Forming a Reply Address in a Connectionless Server, Concurrent Server Algorithms, Master and Slave Processes, A Concurrent Connectionless Server Algorithm, A concurrent Connection-Oriented Server Algorithm, Using separate Programs as Slaves, Apparent Concurrency using a Single Process, When to use each Server Types, The Important Problem of Server Deadlock, Alternative Implementations.

10 Hours

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Visvesvaraya Technological University, Belagavi

MODULE V

Iterative, Connectionless Servers (UDP): Introduction, Creating a Passive Socket, Process Structure, An example TIME Server. Iterative, Connection-Oriented Servers (TCP): Introduction, Allocating a Passive TCP Socket, A Server for the DAYTIME Service, Process Structure, An Example DAYTIME Server, Closing Connections, Connection Termination and Server Vulnerability. Concurrent, Connection-Oriented Servers (TCP): Introduction, Concurrent ECHO, Iterative Vs Concurrent Implementations, Process Structure, An example Concurrent ECHO Server, Cleaning up Errant Processes.

10 Hours

LABORATORY WORK:

1. Design, develop, and execute a program in C under UNIX / LINUX environment to implement a simple iterative connectionless server and demonstrate its functioning.
2. Design, develop, and execute a program in C under UNIX / LINUX environment to implement a simple iterative connection-oriented server and demonstrate its functioning.
3. Design, develop, and execute a program in C under UNIX / LINUX environment to implement a simple concurrent connection-oriented server and demonstrate its functioning.
4. Design, develop, and execute a program in C under UNIX / LINUX environment to implement a simple Day / Time Server and demonstrate its functioning.
5. Design, develop, and execute a program using JAVA networking facilities to implement a simple Day / Time Server and demonstrate its functioning. Repeat the above problems.

COURSE OUTCOMES :

The student will be able to:

- Gain in depth knowledge about Client-Server software, Context Switching and Protocol Software, I/o.
- Programming System Calls, Basic I/O Functions available in UNIX
- Gain the knowledge on Socket interface, TCP, UDP in details.
- Pros and cons of Client Software Various applications and their issues:

TEXT BOOK:

1. Douglas E.Comer, David L. Stevens: Internetworking with TCP/IP – Vol. 3, Client-Server Programming and Applications, BSD Socket Version with ANSI C, 2nd Edition, Pearson, 2001

Employability.

18

SEMESTER IV

ANALYSIS OF COMPUTER NETWORKS

Course Code	**: 14SCN421**	**Credits(L:T:P): 4:0:0**
Core/Elective	**: Elective**	**Type of Course: Lecture**
Total Contact Hours : 50		

COURSE OBJECTIVES :

- To Become familiar with the concepts of computer networks
- What is a computer network and what are the fundamental protocols.
- To analyze network architectures in stochastic and deterministic way.
- RSVP, Principles of TCP
- To explore more on different network protocols.
- To understand the knowledge of multiplexing, streaming sessions in computer network.

TOPICS:

MODULE I

Introduction: Two examples of analysis: Efficient transport of packet voice calls, Achievable throughput in an input-queuing packet switch; the importance of quantitative modeling in the Engineering of Telecommunication Networks.

10 Hours

MODULE II

Multiplexing: Network performance and source characterization; Stream sessions in a packet network: Delay guarantees; Elastic transfers in a packet network; Packet multiplexing over Wireless networks.

10 Hours

MODULE III

Stream Sessions: Deterministic Network Analysis; Events and processes in packet multiplexer models: Universal concepts; Deterministic traffic models and Network Calculus; Scheduling; Application to a packet voice example; Connection setup: The RSVP approach; Scheduling (continued).

10 Hours

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Visvesvaraya Technological University, Belagavi

MODULE IV

Stream Sessions: Stochastic Analysis: Deterministic analysis can yield loose bounds; Stochastic traffic models; Additional notation; Performance measures; Little's theorem, Brumelle's theorem, and applications; Multiplexer analysis with stationary and ergodic traffic; The effective bandwidth approach for admission control; Application to the packet voice example; Stochastic analysis with shaped traffic; Multihop networks; Long-Range-Dependent traffic.

10 Hours

MODULE V

Adaptive Bandwidth Sharing for Elastic Traffic: Elastic transfers in a Network; Network parameters and performance objectives; sharing a single link; Rate-Based Control; Window-Based Control: General Principles; TCP: The Internet's Adaptive Window Protocol; Bandwidth sharing in a Network.

10 Hours

Course Outcomes:

On completion, student will be able to:

- List and classify network services, protocols and architectures, explain why they are layered.
- Implement key Internet applications and their protocols, and will apply to develop their own applications (e.g. Client Server applications, Web Services) using the sockets API.

TEXT BOOKS:

1. Anurag Kumar, D. Manjunath, Joy Kuri: Communication Networking An Analytical Approach, Elsevier, 2004.

REFERENCE BOOKS:

1. M. Schwartz: Broadband Integrated Networks, Prentice Hall PTR, 1996.
2. J. Walrand, P. Varaiya: High Performance Communication Networks, 2nd Edition, Morgan Kaufmann, 1999

Employability.

SEMESTER IV

SERVICE ORIENTED ARCHITECTURE

Course Code	: 14SCN422	Credits(L:T:P): 4:0:0
Core/Elective	: Elective	Type of Course: Lecture
Total Contact Hours : 50		

Course Objectives:

- To understand various architecture for application development
- To understand the importance of SOA in Application Integration
- To learn web service and SOA related tools.
- To learn the concepts of SOA governance.

Topics:

MODULE I

SOA BASICS: Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOA programming models

10 Hours

MODULE II

SOA ANALYSIS AND DESIGN: Service-oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA – stakeholder OBJECTIVES – benefits of SPA – Cost Savings

10 Hours

MODULE III

SOA GOVERNANCE : SOA implementation and Governance – strategy – SOA development – SOA governance – trends in SOA – event-driven architecture – software as a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices

10 Hours

MODULE IV

SOA IMPLEMENTATION: SOA based integration – integrating existing application – development of web services – Integration - SOA using REST

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– RESTful services – RESTful services with and without JWS – Role of WSDL,SOAP and Java/XML mapping in SOA – JAXB Data binding.

10 Hours

MODULE V

APPLICATION INTEGRATION: JAX –WS 2.0 client side/server side development – Packaging and Deployment of SOA component – SOA shopper case study –WSDL centric java WS with SOA-J – related software – integration through service composition (BPEL) – case study - current trends.

10 Hours

COURSE OUTCOMES :

The student will be able to:

- Compare the different IT architecture
- Analysis and design of SOA based applications
- Implementation of web service and realization of SOA
- Implementation of RESTful services
- Design and implementation of SOA based Application Integration using BPEL

TEXTB BOOK:

1. Shankar Kambhampaly, "Service–Oriented Architecture for Enterprise Applications",Wiley 2008.

REFERENCES:

2. Mark D. Hansen, "SOA using Java Web Services", Practice Hall, 2007.
3. Waseem Roshen, "SOA-Based Enterprise Integration", Tata McGraw-HILL, 2009.

Employability

20

SEMESTER IV

MOBILE APPLICATION DEVELOPMENT

Course Code	**: 14SCN423**	**Credits(L:T:P): 4:0:0**
Core/Elective	**: Elective**	**Type of Course: Lecture**
Total Contact Hours : 50		

Course Objectives:

- To Understand system requirements for mobile applications
- To Generate suitable design using specific mobile development frameworks
- To Generate mobile application design
- To Implement the design using specific mobile development frameworks
- To acquire knowledge of android applications development.

Topics:

MODULE I

Introduction to Mobile Communication and Computing: Introduction to mobile computing, Novel applications, limitations and GSM architecture, Mobile services, System architecture, Radio interface, protocols, Handover and security. Smart phone operating systems and smart phones applications.

10 Hours

MODULE II

Fundamentals of Android Development: Introduction to Android., The Android 4.1 Jelly Bean SDK, Understanding the Android Software Stack, Installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text View Control, Using the Android Emulator, The Android Debug Bridge (ADB), Basic Widgets Understanding the Role of Android Application Components, Event Handling , Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit ext Control .

10 Hours

MODULE III

The Android Debug Bridge (ADB), Basic Widgets Understanding the Role of Android Application Components, Event Handling , Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit ext Control Building Blocks for Android Application Design, Laying Out Controls in Containers, Utilizing Resources and Media, Using Selection Widgets and

Debugging Displaying and Fetching Information Using Dialogs and Fragments

10 Hours

MODULE IV

Using Selection Widgets and Debugging Displaying and Fetching Information Using Dialogs and Fragments Advanced Android Programming: Internet, Entertainment, and Services, Implementing drawing and animations,

10 Hours

MODULE V

Displaying web pages and maps, communicating with sms and emails,. creating and using content providers: Creating and consuming services, Publishing android applications.

10 Hours

Course Outcomes:

The student will be able to:

- Describe the requirements for mobile applications
- Explain the challenges in mobile application design and development
- Develop and design for mobile applications for specific requirements
- Implement the design using Android SDK
- Implement the design using Objective C and iOS

TEXT BOOKS:

1. Mobile Computing: Technologies and Applications- N. N. Jani S chand,2009.
2. B.M.Hirwani- Android programming Pearson publications-2013

Employability

21

SEMESTER IV

CYBERCRIME AND DIGITAL FORENSIC

Course Code	: 14SCN424	Credits(L:T:P): 4:0:0
Core/Elective	: Elective	Type of Course: Lecture
Total Contact Hours : 50		

Course Objectives :

- To understand Accounting Forensics
- To analyze the nature and effect of cyber crime in society.
- To understand Sarbanes-Oxley Financial and Accounting Disclosure Information
- To understand Computer Crime and Criminals
- To understand Liturgical Procedures

Topics:

MODULE I

INTRODUCTION: Introduction and Overview of Cyber Crime, Nature and Scope of Cyber Crime, Types of Cyber Crime: Social Engineering, Categories of Cyber Crime, Property Cyber Crime.

10 Hours

MODULE II

CYBER CRIME ISSUES: Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Intellectual Property, Mail Bombs, Exploitation, Stalking and Obscenity in Internet, Digital laws and legislation, Law Enforcement Roles and Responses.

10 Hours

MODULE III

INVESTIGATION: Introduction to Cyber Crime Investigation, Investigation Tools, e-Discovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

10 Hours

MODULE IV

DIGITAL FORENSICS: Introduction to Digital Forensics, Forensic Software

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Visvesvaraya Technological University, Belagavi

and Hardware, Analysis and Advanced Tools, Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.

10 Hours

MODULE V

LAWS AND ACTS: Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC , Electronic Communication Privacy ACT, Legal Policies.

10 Hours

Course Outcomes :

The student will be able to:

- Understand financial and accounting forensics, and explain their role in preventing various forms of fraud.
- Distinguish various types of computer crime, and use computer forensic techniques to identify the digital fingerprints associated with criminal activities.
- Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.
- Develop a custom computer forensic analysis tool.

Text:

1. Nelson Phillips and Enfinger Steuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
2. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006.

REFERENCES:

1. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.
2. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004.

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SEMESTER I

Employability

Problem Solving Using C

Sub. Code	:	**13MCA11**	**IA Marks**	:	**50**
Hrs/Week	:	**4**	**Exam Hours**	:	**03**
Total Hours	:	**52**	**Exam Marks**	:	**100**

Unit 1 **9 Hours**

Algorithms, Flow Charts, C structure, Variables, Data types, Constants, Declarations, Operators, Precedence, Associativity, Order of evaluation, Type conversion, Storage classes, Programming Examples

Unit 2 **10 Hours**

Input and output statements – scanf, getchar, gets, printf, putchar, puts; Control Statements – if, else-if, switch, Control Structures – while, for, do-while, break and continue, goto, Programming Examples

Unit 3 **8 Hours**

Arrays – Single dimension, Two dimensional, Multi dimensional Arrays, Strings, Programming Examples

Unit 4 **10 Hours**

Functions, Categories of functions, Pointers, Pointer arithmetic, Call by value, Pointer Expression, Pointer as function arguments, , recursion, Passing arrays to functions, passing strings to functions, Call by reference, Functions returning pointers, Pointers to functions, Programming Examples

Unit 5 **5 Hours**

Structures and Unions – defining, declaring, initialization, accessing, comparing, operations on individual members; array of structures, structures within structures, structures and functions, pointers and structures, bit fields, Programming Examples

Unit 6 **10 Hours**

Files – defining, opening, closing, input and output operations, error handling, random access; Command line arguments; Dynamic Memory Allocation –definition, malloc, calloc, realloc, free, dynamic arrays;

Preprocessor – definition, macro substitution, file inclusion, compiler control directives, Programming Examples

Text Books

1. Let us C, Yashwant Kanetkar, BPB Publications
2. Programming with C, Balaguruswamy
3. The C Programming Language, Brian W Kernighan, Dennis M Rtchie, PHI, 2nd Edition

Reference Books

1. Programming with C, Byron Gottfried, Tata McGraw-Hill edition
2. Simplifying C, Harshal Arolkar, Sonal Jain, Wiley Publications
3. Head First C, David Griffiths, & Dawn Griffiths, O'Riley.
4. C Programming, Dr. Vishal M Lichade, Dreamtech press.

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Discrete Mathematical Structures

Subject Code : 13MCA12 | **I.A. Marks : 50**
Hours/Week : 04 | **Exam Hours : 03**
Total Hours : 52 | **Exam Marks : 100**

Fundamentals of Logic **14 Hours**

Basic Connectives and Truth Tables, Logic Equivalence :The laws of Logic, Logical Implications: Rules of Inference, The use of Quantifiers, Quantifier Definitions, Proofs of Theorems.

Set Theory **7 Hours**

Sets and Subsets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams, Principles of Inclusion and Exclusion, The rules of sum and product, Permutations and Combinations with repetition

Properties of Integers and Recurrence **7 Hours**

Mathematical Induction, Recursive definitions, The Greatest Common Divisor Euclidian Algorithms, The first order Linear recurrence relation.

Relations and Functions **14 Hours**

Cartesian products and Relations, Functions-Plain and One-to-One, Onto Functions, Stirling Numbers and the Second Kind, Special functions, The Pigeon-hole principle, Function composition and inverse functions. Properties of Relations, Computer recognition-Zero One Matrices and Directed graphs, Posets and Hasse Diagrams, Equivalence relation and Partitions, lattices.

Graph Theory and Trees **10 Hours**

Terminology, Definitions, Properties and Examples, Connectivity and Adjacency, Euler and Hamilton, Representation and Isomorphism, Planarity and Chromatic Number, Directed Graphs and Weighted Graphs, Rooted Trees, Trees and Sorting

Text Books

1. Ralph P Grimaldi, B.V.Ramana, "Discrete & Combinatorial Mathematics, An Applied Introduction" 5th Edition, Pearson Education, 2004 (Chapter1: 1.1-1.4, Chapter 2: 2.1-2.5, Chapter 3: 3.1-3.4, Chapter 4: 4.1-4.2,4.4, Chapter 5:5.1-5.6, Chapter 7:7.1-, 7.4,7.6, Chapter 10:10.1, Chapter 12: 12.1-12.4)
2. Eric Gosset "Discrete Mathematics with Proof" Wiley India, 2nd Edition,(Chapter 10:10.1-10.6)

Reference books

1. Kenneth H Rosen, "Discrete Mathematics & its Applications" 7th edition, McGraw-Hill, 2010
2. Y N Singh "Discrete Mathematical Structures" Wiley India, 1st edition, 2010
3. Jayant Ganguly: A Treatise on Discrete Mathematical Structures" Pearson, 2010
4. D.S. Malik & M.K Sen: Discrete Mathematical Structures: Theory & Applications, Cengage Learning, 2004
5. Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008

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3 Fundamentals Of Computer Organization Employability

Subject Code: 13MCA13 **I.A. Marks : 50**
Hours/Week : 04 **Exam Hours : 03**
Total Hours : 52 **Exam Marks : 100**

Binary Systems **6 Hours**
Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, subtraction using r's and r-1 complements, Binary Code, Binary Storage and Registers, Binary Logic, Integrated Circuits.

Combinational Logic and Arithmetic Circuits **14 Hours**
Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, The map Method, Two – and Three – Variable Maps, Four – Variables Map, Product of Sums Simplification, NAND and NOR Implementation, Other Two- Level Implementations, Don't Care Conditions. Introduction, Adders, Subtractors, Binary Parallel Adder, Decimal Adder, Magnitude Comparator, Decoders, Multiplexers, BOOTH algorithm for signed numbers with example.

Sequential Logic **6 Hours**
Introduction, different types of Flip – Flops, Triggering of Flip- Flops, Registers, Shift Registers, Ripple counter and Synchronous Counter .

Basic Structure of Computers **6 hours**
Computer Types, Functional Units, Basic Operational Concepts, Bus structure, Software, Performance, Multiprocessing and Multicomputers, Introduction to Assemblers and Compilers.

Machine Instruction and Programs **7 Hours**
Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Examples from Assembly Language Programming.

Input/Output Organization **7 Hours**
Accessing I/O Devices, Interrupts, DMA, Processor Example, Buses. Case study of IA32 Intel processor

The Memory System **6 Hours**
Some Basic Concepts, Semiconductor RAM Memories, Read – Only Memories, Speed, Size, and Cost, Cache Memories, Virtual Memories, Memory Management Requirements, Secondary Storage.

Text Books:

1. M. Morris Mano, "Digital Logic and Computer Design", Pearson, 2012.
2. Carl Hamacher, Zvonko Vranesic Safwat Zaky,"Computer Organization", 5th edition, Tata McGraw-Hill, 2011

Reference Books:

1. John P. Hayes, "Computer Architecture and Organization", Tata McGraw - Hill, 3rd Edition, 2012.
2. Soumitrs Kumar Mandal, "Digital Electronics – Principles and Applications", Tata McGraw - Hill, 2010

4 Introduction to UNIX

Sub Code :13MCA14
Hrs/Week :04
Total Hours :52

IA Marks : 50
Exam Hours : 03
Exam Marks : 100

Introduction of UNIX **9 Hours**

Introduction, History, Architecture, Experience the Unix environment, Basic commands ls, cat, cal, date, calendar, who, printf, tty, sty, uname, passwd, echo, tput, bc, script, spell and ispell, UNIX File System: The file, what's in a filename? The parent-child relationship, pwd, the Home directory, absolute pathnames, using absolute pathnames for a command, cd, mkdir, rmdir, Relative pathnames, The UNIX file system.

Introduction to the Shell **7 Hours**

Introduction to Shell Scripting, Shell Scripts, read, Command Line Arguments, Exit Status of a Command, The Logical Operators && and ||, exit, if, and case conditions, expr, sleep and wait, while, until, for, $, @, redirection. The here document, set, trap, Sample Validation and Data Entry Scripts.

Basic File Attributes **8 Hours**

Is – l, the –d option, File Permissions, chmod, Security and File Permission, users and groups, security level, changing permission, user masks, changing ownership and group, File Attributes, More file attributes: hard link, symbolic link, umask, find

Simple Filters **9 Hours**

Pr, head, tail, cut, paste, sort, uniq, tr commands, Filters using Regular Expression : grep & sed grep, Regular Expression, egrep, fgrep, sed instruction, Line Addressing, Inserting and Changing Text, Context addressing, writing selected lines to a file, the –f option, Substitution, Prosperities of Regular Expressions Context addressing, writing selected lines to a file, the –f option, Substitution, Properties of Regular Expressions

Awk-Advanced Filters **9 Hours**

Simple awk Filtering, Splitting a Line into Fields, printf, the Logical and Relational Operators, Number Processing, Variables, The –f option, BEGIN and END positional Parameters, get line, Built-in variables, Arrays, Functions, Interface with the Shell, Control Flow, Advanced Shell Programming, The sh command, export, cd, the Command, expr, Conditional Parameter Substitution, Merging Streams, Shell Functions, eval, Exec Statement

The Process **8 Hours**

Process basics, PS, internal and external commands, running jobs in background, nice, at and batch, cron, time commands, Essential System Administration root, administrator's privileges, startup & shutdown, managing disk space, cpio, tar, Customizing the Environment : System Variables, profile, sty, PWD, Aliases, Command History, On-line Command Editing

Advanced System Administration **2 Hours**

Case Study: emacs editor and any one distribution of Linux

Text Book:

1. Your UNIX-The Ultimate Guide, Sumitabha Das, Tata McGraw Hill,

Reference Book:

1. "Unix Shell Programming", Yashwant Kanetkar,
2. "Beginning Shell Scripting", Eric Foster -Johnson, John C Welch, Micah Anderson, Wrox publication.
3. "Introduction to UNIX" by M G Venkatesh Murthy.

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5 **Introduction to Web Technologies** Employability

Subject Code: 13MCA15 **I.A. Marks : 50**
Hours/Week: 4 **Exam Marks : 100**
Total Hours: 52 **Exam Hours : 3**

Fundamentals **4 Hours**
Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, the Web Programmers Toolbox.

Web Foundations **6 Hours**
Evolution of the Web, Peak into the History of the Web, Internet Applications, Networks, TCP/IP, Higher Level Protocols, Important Components of the Web, Web Search Engines, Application Servers.

Introduction to XHTML **10 Hours**
Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links. Lists, Tables, Forms, Frames. **Cascading Style Sheets:** Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and tags, Conflict resolution.

The Basics of JavaScript: **6 Hours**
Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

JavaScript and HTML Documents **6 Hours**
The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Event Model, The navigator Object, Dom Tree Traversal and Modification.

Dynamic Documents with JavaScript: **6 Hours**
Introduction, Positioning Elements, Moving Elements, Element Visibility, Changing Colors and Fonts, Dynamic Content, Stacking Elements, Locating the Mouse Cursor, Reacting to a Mouse Click, Slow Movement of Elements, Dragging and Dropping Elements.

Introduction to XML **6 Hours**
Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

The Basics of Perl **8 Hours**
Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples. **Using Perl for CGI Programming:** The Common Gateway Interface; CGI linkage; Query string format; CGI.pm module; A survey example; Cookies.

Text Books:

1. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson education, 2012. Chapters 1, 2, 3, 4, 5, 6, 7, 8, 9, 11 & 13
2. M. Srinivasan: Web Technology Theory and Practice, Pearson Education, 2012. Chapter 1, 2, 3 & 4

Reference Books:

1. Jeffrey C. Jackson: Web Technologies- A Computer Science Perspective, Pearson Education, Eleventh Impression, 2012.
2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
3. Internet Technology and Web Design, Instructional Software Research and Development (ISRD) Group, Tata McGraw Hill, 2011.

Chairperson
Dept. of Computer Science and Engineering
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9. Write a Perl program which demonstrates the usage of scalar variables and arrays

10. Write a Perl program to display various Server information like Server Name, Server
Software, Server protocol,CGI Revision etc.

11. Write a Perl program to display a digital clock which displays the current time of the server

12. Write a Perl program to accept the User Name and display a greeting message randomly chosen from a list of 4 greeting messages.

13. Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.

14. Write a CGI-Perl program to use a cookie to remember the day of the last login from a user and display it when run

Note: In the examination *each* student picks one question from the lot of *all* 14 questions.

SEMESTER II

Data Structures Using C

Sub Code : 13MCA21
Hrs/Week : 4
Total Hours : 52

IA Marks : 50
Exam Hours : 3
Exam Marks : 100

Introduction to Data Structures **10 Hours**

Information and its meaning: Abstract Data Types, Sequences as Value Definitions, ADT for Varying length character Strings, Data Types,Pointers and review of Pointers, Data Structures. Arrays : Array as an ADT, Using One-dimensional Arrays, Implementing One-Dimensional Arrays, Arrays as Parameters, Handling of Character Strings and Character Strings

The Stack **8 Hours**

Definition and examples , Primitive operations, Example, The stack as an ADT, Representing stacks ,Implementing the pop operation, Testing for exceptional conditions , Implementing the push operations , Examples for infix , postfix, and prefix expressions, Basic definition and Examples ,Program to evaluate a postfix expression ,Converting an expression from infix to postfix, Program to convert an expression from infix to postfix, Applications of Stacks: Expression Evaluations, Recursion etc.

Recursion **4 Hours**

Recursive definition and processes, Factorial function, Multiplication of natural numbers, Fibonacci sequence, Binary search, Properties of recursive definition or algorithm. Binary search, Towers of Hanoi problem.

Queues and Lists **12 Hours**

The queue and its sequential representation, the queue as ADT, Insert operation, Priority queue, Array implementation of a priority queue. Linked lists, Inserting and removing nodes from a list, Linked implementations of stacks, getnode and Freenode operations, Linked implementation of queues, Linked list as a data Structure, Example of list operations, Header nodes, Array implementation of lists, Limitations of array implementation, allocating and freeing dynamic variables, Linked lists using dynamic variables, Non integer and non-homogenous lists, Other list structures: Circular lists, Stack as a circular lists, doubly linked lists, Application of Linked Lists: Stacks, Queues, Double-ended Queues, Priority Queues.

Sorting **8 Hours**

Bubble sort, Quick sort, Selection sort, Tree Sorting: Binary Tree Sort, Heap Sort, Insertion Sorts: Simple Insertion, Shell Sort, Address Calculation Sort, Merge and Radix Sort.

Searching **5 Hours**

Basic Search Techniques: Algorithmic Notations, Sequential searching, Searching an ordered table, Indexed sequential search, Binary search, Interpolation search, Tree searching: Inserting into a Binary Search Tree ,Deleting form a binary search tree, Hashing : Resolving hash clashes by open addressing, Choosing a hash Function.

Binary Trees **5 Hours**

Tree traversals, Binary Search Tree and Operations, AVL Tree and Operations, Red-Black Tree, Threaded binary trees and operations.

Text Books:

1. Data Structures Using C and C++ by Yedidyah Langsam and Moshe J. Augenstein

7 Object Oriented Programming Using C++ Employability

Sub Code : 13MCA22 **IA Marks : 50**
Hours/Week : 4 **Exam Hours: 3**
Total Hours : 52 **Exam Marks: 100**

Introduction **6 Hours**

Object Oriented paradigm, Structured vs. Object Oriented Paradigm. Elements of Object Oriented Programming: Object, Classes, Encapsulation & data abstraction, Inheritance, Polymorphism etc., C++ Overview, different data types, operators, expressions, const & volatile qualifiers, arrays and strings, reference variables.

Modular Programming with Functions **7 Hours**

Function Components, argument passing, inline functions, function overloading, function templates, recursive functions.

Classes & Objects **14 Hours**

Introduction, Class Specification, Class Objects, access members, defining member functions, data hiding, constructors, destructors, parameterized constructors, static data members, functions, scope resolution operator, passing objects as arguments, returning objects, friend functions & classes, arrays of objects, Dynamic objects – Pointers to objects, Class members, Operator overloading using friend functions such as ++, --, [ ] etc. Class templates.

Inheritance Virtual functions & Polymorphism **12 Hours**

Base Class, Inheritance & protected members, protected base class inheritance, inheriting multiple base classes, Constructors, Destructors & Inheritance. Passing parameters to base Class Constructors, Granting access, Virtual base classes, Virtual function -Calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, pure virtual functions, abstract classes, using Virtual functions, Early & late binding.

I/O Streams **5 Hours**

IO Stream basics, output operator <<, input >>, additional I/O operators, overloading the output operator <<, overloading the input operator >>, file input & output, manipulators.

Exception Handling, STL **8 Hours**

Exception handling fundamentals, Exception handling options, STL: An overview, containers, vectors, lists, maps.

Text Books:

1. Herbert Schildt: C++ The Complete Reference, 4th Edition, Tata McGraw Hill, 2007.

Reference Book:

1. Stephen Prata : C++ Primer Plus, 6th Edition, Person Education.
2. Al Stevens: C++ Programming, 7th Edition, Wiley India Publications
3. Stanley B.Lippmann, Josee Lajore: C++Primer, 4th Edition, Addison Wesley, 2005.
4. Object oriented programming with C++, E. Balaguruswamy, TMH.

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8 **Operating Systems** Employability

Subject Code: 13MCA23
Hours/Week : 4
Total Hours : 52

I.A. Marks : 50
Exam Hours : 3
Exam Marks : 100

Introduction: Computer and Operating Systems **6 Hours**
Basic Elements, Processor Registers, Instruction Execution, Interrupts, The Memory Hierarchy, Cache Memory, I/O Communication Techniques, Introduction to Operating System, Mainframe Systems, Desktop Systems, Multiprocessor Systems, Distributed Systems, Clustered Systems, Real - Time Systems, Handheld Systems, Feature Migration, Computing Environments.

Operating System Structures: System Structures **5 Hours**
System Components, Operating – System Services, System Calls, System Programs, System Structure, Virtual Machines, System Design and Implementation, System Generation.

Process Management **6 Hours**
Process, Process States, Process Description, Process Control, Execution of the Operating System, Security Issues, Processes and Threads, Symmetric Multiprocessing(SMP), Micro kernels, CPU Scheduler and Scheduling.

Mutual Execution and Synchronization **6 Hours**
Principles of Concurrency, Mutual Exclusion: Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writes Problem

Deadlock and Starvation **4 Hours**
Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategy, Dining Philosophers Problem

Memory Management **8 Hours**
Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Process Creation, Page Replacement, Allocation of Frames, Thrashing

File – System Interface and Implementation **7 Hours**
File Concept, Access Methods, Directory Structure, File – System Mounting, File Sharing, Protection, File – System Structure, File – System Implementation, Directory Implementation, Allocation Methods, Free – Space Management.

Secondary Storage, Computer Security **4 Hours**
Disk Structure, Disk Scheduling, Disk Management, The Security Problem, User Authentication, Program Threats, System Threats.

Case study of Linux Operating system: **6 Hours**
Linux System , Linux history , Design Principles, Kernel modules, Process management, scheduling, Memory management, File systems, Input and output, Inter-process communications.

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Text Books

1. Silberschatz, Galvin, Gagne, "Operating System Concepts" John Wiley, Sixth Edition, 2004
2. William Stallings, "Operating Systems – Internals and Design Principles" Pearson, 6th edition, 2012

Reference Books

1. Chakraborty , "Operating Systems" Jaico Publishing House, 2011.
2. Dhananjay M. Dhamdhere, "Operating Systems – A Concept – Based Approach", Tata McGraw – Hill, 3rd Edition, 2012
3. Elmasri, Carrick, Levine, "Operating Systems – A spiral Approach", Tata McGraw – Hill, 2012

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9 System Software Employability

Subject Code: 13MCA24 **I.A. Marks : 50**
Hours/Week : 04 **Exam Hours: 03**
Total Hours : 52 **Exam Marks : 100**

Machine Architecture **6 Hours**

Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples.

Assemblers **12 Hours**

Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures, Machine Dependent Assembler Features - Instruction Formats & Addressing Modes, Program Relocation. Machine Independent Assembler Features – Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking, Assembler Design Operations - One-Pass Assembler, Multi-Pass Assembler, Implementation Examples - MASM Assembler.

Loaders and Linkers **8 Hours**

Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader, Machine- Dependent Loader Features – Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader; Machine-Independent Loader Features - Automatic Library Search, Loader Options, Loader Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders, Implementation Examples - MS-DOS Linker.

Editors And Debugging Systems **6 Hours**

Text Editors - Overview of Editing Process, User Interface, Editor Structure, Interactive Debugging Systems - Debugging Functions and Capabilities, Relationship With Other Parts Of The System, User-Interface Criteria

Macro Processor **8 Hours**

Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features – Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options - Recursive Macro Expansion, General- Purpose Macro Processors, Macro Processing Within Language Translators, Implementation Examples - MASM Macro Processor, ANSI C Macro Processor.

Compilers **12 Hours**

Basic Compilers Functions- Grammars, Lexical Analysis, Syntactic Analysis, Code Generation. Machine Dependent Compiler Features- Intermediate Form of the Program, Machine dependent code Optimization. Machine Independent Compiler Features- Structured variables, Machine Independent code Optimization. Compiler Design Options- Division into passes, Interpreters, P-code Compilers, Compiler-Compilers.

Text Books:

1. Leland.L.Beck: System Software, 3rd Edition, Addison-Wesley, 1997. (Chapters 1.1 to 1.3, 2 (except 2.5.2 and 2.5.3), 3 (except 3.5.2 and 3.5.3), 4 (except 4.4.3,) 5.1, 5.2, 5.3 (except 5.3.3, 5.3.4), 5.4)

Reference Books:

1. D.M.Dhamdhere: System Programming and Operating Systems, 2nd Edition, Tata McGraw - Hill, 1999

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10 **Database Management Systems** Employability

Subject code : 13MCA25 **I.A.Marks : 50**
Hours/Week : 04 **Exam Hours : 03**
Total Hours : 52 **Exam Marks : 100**

Unit-1: Introduction **7 Hours**

An example; Characteristics of Database approach; Actors on the screen; Workers behind the scene; Advantages of using DBMS approach; A brief history of Database Applications; When not to use a DBMS. Data Models, Schemas and Instances; Three-Schema Architecture and Data Independence; Database Languages and Interfaces; The Database System Environment; Centralized and Client-Server Architectures for DBMSs; Classification of Database Management Systems

Unit-2: Entity-Relationship Model **7 Hours**

Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship Types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design for COMPANY Database; ER Diagrams, Naming Conventions and Design Issues; Relationship Types of Degree Higher than Two, Relational Database Design Using ER- to-Relational Mapping

Unit-3: Relational Model and Relational Algebra **12 Hours**

Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and Dealing with Constraint Violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations; Examples of Queries in Relational Algebra;

Unit-4: SQL **12 Hours**

SQL Data Definition and Data Types; Specifying Constraints in SQL; Schema Change Statements in SQL; Basic Queries in SQL; More Complex SQL Queries, Insert, Delete and Update Statements in SQL; Specifying Constraints as Assertions and Triggers; Views (Virtual Tables) in SQL; Additional Features of SQL; Database Programming: Issues and Techniques; Embedded SQL, Dynamic SQL; Database Stored Procedures and SQL / PSM.

Unit-5: Database Design **8 Hours**

Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form

Unit-6: PL/SQL **6 Hours**

Introduction, Language fundamentals, conditional and sequential control, Iterative processing and loops. Exception handlers, triggers. Functions, procedures. Creating and planning PL/SQL.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, 5th Edition, Pearson Education, 2007. (Chapters 1, 2, 3 except 3.8,5, 6.1 to 6.5, 7.1, 8, 9.1, 9.2 except SQLJ, 9.4, 10, 17, 18 except 18.6, 18.7, 19)

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Reference Books:

1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003
2. Silberschatz, Korth and Sudharshan: Data base System Concepts, 5th Edition, Mc-GrawHill, 2006.
3. Database Principles Fundamentals of Design, Implementation and Management by Coronel, Morris, Rob- Cengage Learning 2012

SEMESTER III

Computer Networks

Employability

Subject Code: 13MCA31
Hours/Week : 4 Hrs.
Total Hours : 52 Hrs.

IA.Marks : 50
Exam Duration : 3 Hrs
Examination Marks : 100

Introduction to Computer Networks **3 Hours**

Networking Devices ,Classification of Computer Networks ,Network Protocol Stack (TCP/IP and ISO-OSI),Network Standardization and Examples of Networks.

Physical Layer **10 Hours**

Data Transmission Concepts, Analog and Digital Data Transmission ,Transmission Impairments and Channel Capacity, Guided and Wireless transmission, communication media, Digital modulation techniques (FDMA,TDMA,CDMA) and mobile telephone systems (1G,2G,3G and 4G).

Data Link layer **5 Hours**

Error Detection and Correction Codes,Data Link Protocols and Sliding window protocols.

Medium Access Sub Layer **4 Hours**

Multiple access protocols and Examples : Ethernet, Wireless LAN, Broadband Wireless and bluetooth, Data Link Layer Switching.

Network Layer **14 Hours**

Network Layer Design issues, Routing algorithms, Congestion Control Algorithms, Quality of Service, Internetworking and The Network Layer in the Internet

The Transport Layer **12 Hours**

The Transport Service, Elements of Transport Protocols, Congestion Control, The Internet Transport Protocol: UDP,The Internet Transport Protocols – TCP, Performance Issues.

The application Layer **4 Hours**

DNS, Email,WWW,Streaming audio and Video and Content Delivery

Text Books

1. "Computer Networks" by Andrew S Tanenbaum, David J Wetheral, 5th Edition, Pearson 2012
Chapter 1, 2.2, 2.3, 2.5, 2.7, 3.1, 3.2, 3.3, 3.4, 4.2, 4.3, 4.4, 4.5, 4.6, 4.8 Chapter 5, Chapter 6 (excluding 6.7)
2 "Data and Computer Communications" by William Stallings , Above 7th edition , 2004 Chapter 3

Reference Books

1. "Computer Networks" Principles,Technologies and Protocols for Network Design, by NATALA OLIFER and VICTOR OLIFER , 2010
2. http://www.ietf.org/rfc.html relevant RFC document could be used to get more detailed information about any of the concepts prescribed in the syllabus like RFC 2460 can be referred to get a detailed information about IPV6

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12 **Programming using JAVA** Employability

Subject Code : 13MCA32 **I.A. Marks: 50**
Hours/Week : 4 **Exam Hours : 3**
Total Hours : 52 **Exam Marks : 100**

Java Programming Fundamentals **2 Hours**
The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, Handling Syntax Errors, The Java Keywords, Identifies in Java, The Java Class Libraries.

Introducing Data Types and Operators **1 Hour**
Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast, Operator Precedence, Expressions.

Program Control Statements **1 Hour**
Input characters from the Keyword, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Use break, Use continue, Nested Loops

Introducing Classes, Objects and Methods **3 Hours**
Class Fundamentals, How Objects are Created, Reference Variables and Assignment, Methods, Returning from a Method, Returning Value, Using Parameters, Constructors, Parameterized Constructors, The new operator Revisited, Garbage Collection and Finalizers, The this Keyword.

More Data Types and Operators **2 Hours**
Arrays, Multidimensional Arrays, Alternative Array Declaration Syntax, Assigning Array References, Using the Length Member, The For-Each Style for Loop, Strings, The Bitwise operators.

String Handling **2 Hours**
String Fundamentals, The String Constructors, Three String-Related Language Features, The Length() Method, Obtaining the characters within a string, String comparison, using indexOf() and lastIndexOf(), Changing the case of characters within a string, StringBuffer and String Builder.

A Closer Look at Methods and Classes **3 Hours**
Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes, Varargs: Variable-Length Arguments.

Inheritance **6 Hours**
Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why Overridden Methods, Using Abstract Classes, Using final, The Object Class.

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Interfaces **3 Hours**

Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces, Interfaces can be extended, Nested Interfaces, Final Thoughts on Interfaces.

Packages **3 Hours**

Package Fundamentals, Packages and Member Access, Importing Packages, Static Import

Exception Handling **4 Hours**

The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throwable, using finally, using throws, Java's Built-in Exceptions, New Exception features added by JDK 7, Creating Exception Subclasses.

Multithreaded Programming **4 Hours**

Multithreading fundamentals, The Thread Class and Runnable Interface, Creating Thread, Creating Multiple Threads, Determining When a Thread Ends, Thread Priorities, Synchronization, using Synchronization Methods, The Synchronized Statement, Thread Communication using notify(), wait() and notify All(), suspending, Resuming and stopping Threads.

Enumerations, Auto boxing and Annotations **4 Hours**

Enumerations, Java Enumeration are class types, The Values () and Valueof () Methods, Constructors, methods, instance variables and enumerations, Auto boxing, Annotations (metadata)

Generics **2 Hours**

Generics Fundamentals Bounded Types, Generic Methods, Generic Constructors, Some Generic Restrictions.

Applets **2 Hours**

Applet basics, A complete Applet Skeleton, Applet Initialization and Termination, A key Aspect of an Applet Architecture, Requesting Repainting, using the status window, Passing parameters to Applets.

Swing Fundamentals **4 Hours**

The origin and Design philosophy of swing, Components and containers, Layout managers, A first simple swing Example, Event Handling, **Exploring Swing Controls**-JLabel and ImageIcon, The Swing Buttons, Trees.

Networking with Java.net **3 Hours**

Networking fundamentals, The Networking classes and Interfaces, The InetAddress class, The Socket Class, The URL class, The URLConnection Class, The HttpURL Connection Class.

Exploring Collection Framework **3 Hours**

Collections Overview, The Collection Interfaces, The collection Classes. The Arrays Class.

Text Books:

1. J

ava Fundamentals, A comprehensive Introduction by Herbert Schildt, Dale Skrien. Tata McGraw Hill Edition 2013. (Chapters: 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,17,18,22,23,24,25,26)

Reference Books:

1. Programming with Java by T V Suresh Kumar, B Eshwara Reddy and P Raghavan, Sanguine Technical Publishers, 2011.
2. Programming in JAVA2 by Dr K Somasundaram ,Jaico publications
3. Java Programming by Hari Mohan Pandey, Pearson Education, 2012.
4 Java 6 Programming, Black Book, KoGenT , dreamtech Press, 2012.
5. Java 2 Essentials, Cay Hortsmann, second edition, Wiley

13 **Software Engineering** Employability

Subject Code: 13MCA33
Hours/Week: 4
Total Hours : 52

I.A. Marks : 50
Exam Hours : 3
Exam Marks : 100

1. Overview **03 hours**

Introduction: Professional Software Development Attributes of good software, software engineering diversity, IEEE/ ACM code of software engineering ethics, case studies

2. Software Process & Agile Software Development **10 hours**

Software Process models: waterfall, incremental development, reuses oriented, Process activities; Coping with change, The rational Unified process. Agile methods, Plan-driven and agile Development, Extreme Programming, Agile project management, Scaling agile methods.

3. Requirements Engineering **06 hours**

Functional and non-functional requirements, The software requirements document, Requirements specification, Requirements engineering processes, Requirement elicitation and analysis, Requirements validation, Requirements management

4. System Modeling, Architectural Design & Design and implementation **16 hours**

Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering, Software architecture: the role of software architecture, architectural views, component and connector view, Architectural styles for C&C view, Documenting architectural design.Design: Design concepts, Function oriented design, detailed design, verification, matrix (Complexity matrix for function oriented design),

5. Component-based software engineering **04 hours**

Components and component model, CBSE process, Component composition

6. Distributed Software engineering **05 hours**

Distributed system issues, Client-server computing, Architectural patterns for distributed systems, Software as a service.

7. Planning a software Project **04 hours**

Process planning, Effort estimation, Project scheduling and staffing, Software configuration management plan, Quality plan, Risk Management, Project monitoring plan.

8. Software Testing **04hours**

Testing fundamentals, Black-box testing, White-box testing, Testing process

Text Books:

1. Ian Sommerville : Software Engineering, 9th edition, Person Education Ltd, 2011. (Chapters-: 1, 2, 3, 4, 5, 17, 18)
2. Pankaj Jalote: Software engineering, Wiley India Pvt Ltd (2010) (Chapters-:4, 6.1, 6.2, 6.5, 6.6)

Reference Books:

1. Roger S Pressman: Software Engineering-A Practitioners approach, 6th edition, McGraw-Hill, 2010.
2. Hans Van Vliet: Software Engineering Principles and Practices, 3rd Edition, Wiley – India, 2010

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3 Software Engineering architectural driven software developments by R Schmidt

14 **Computer Graphics** Employability

Subject Code : 13MCA34
Total Hours : 52
Hours/Week : 4

I.A. Marks: 50
Exam Hours: 3
Exam Marks: 100

Graphics Output Primitives and Attributes **12 Hours**

Introduction to open GL, Coordinate reference frames, Specifying two dimensional world coordinate reference frame in Open GL, Open GL point functions, Open GL line functions, Line drawing algorithms, Circle generation algorithms, Ellipse generation algorithms, Fill area primitives, Polygon fill areas, OpenGL polygon fill area functions, General scan line polygon fill algorithm, Fill methods for areas with irregular boundaries, Open GL fill area attribute functions

Two – Dimensional and Three - Dimensional Geometric Transformations **12 Hours**

Basic two dimensional geometric transformations, Matrix representations and homogeneous coordinates, Inverse transformations, Two dimensional composite transformations, Other two dimensional transformations, Three dimensional Translation, Rotation, Scaling, Other three dimensional transformations, Affine transformations, Open GL geometric transformation functions

Two Dimensional Viewing **10 Hours**

The two dimensional viewing, Clipping window, Normalization and viewport transformations, Clipping algorithms, Two dimensional point clipping, Two dimensional line clipping algorithms, Polygon fill area clipping, Curve clipping, Text clipping

Three Dimensional Viewing **10 Hours**

The three dimensional viewing concepts, Three dimensional viewing pipeline, Three dimensional viewing coordinate parameters, Transformation from world to viewing coordinates, Projection transformations, Orthogonal projections, Oblique parallel projections, Perspective projections, The viewport transformation and three dimensional screen coordinates

Curves and Computer Animation **08 Hours**

Bezier spline curves, Raster methods for computer animation, Design of animation sequences, Traditional animation techniques, General computer animation functions

Text book:

Donald Hearn, M.Pauline Baker, Computer Graphics with Open GL, Pearson (Indian Edition), Third Edition. Chapters and topics [2.9, 3.1-3.5, 3.9, 3.10, 3.14-3.16, 4.10, 4.13, 4.14, 5.1-5.5, 5.10-5.15, 5.17, 6.1-6.3, 6.5-6.10, 7.1-7.9, 8.10, 13.1-13.4]

Reference Books:

1. Edward Angel, 'Interactive Computer Graphics' – A top down approach using Open GL, Pearson, Fifth Edition
2. Peter Shirley, Steve Marschner, 'Computer Graphics, Cengage Learning (Indian edition), 2009.

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UNIX System Programming

Employability

Subject Code : 13MCA351	**I.A. Marks : 50**
Hours/Week : 4	**Exam Hours : 03**
Total Hours : 52	**Exam Marks : 100**

Introduction **6 Hours**

UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards. UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics.

UNIX Files **6 Hours**

File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.

UNIX File APIs **7 Hours**

General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs, General File Class, regfile Class for Regular Files, dirfile Class for Directory Files, FIFO File Class, Device File Class, Symbolic Link File Class, File Listing Program.

UNIX Processes **7 Hours**

The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes.

Process Control **7 Hours**

Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, waited, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times. Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp, tcsetpgrp, and tcgetsid Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups.

Signals and Daemon Processes **7 Hours**

Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers. Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Single- instance daemons; Daemon conventions; Client-Server Model.

Interprocess Communication **6 Hours**

Introduction; Pipes, popen, pclose Functions; Coprocesses; FIFOs; XSI IPC; Message Queues; Semaphores

Network IPC: Sockets **6 Hours**

Introduction; Socket Descriptors; Addressing; Connection establishment; Data transfer; Socket options; Out-of-band data; Nonblocking and asynchronous I/O.

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Text Books:

1. Terrence Chan: Unix System Programming Using C++, Prentice-Hall of India / Pearson Education, 1999. (Chapters 1, 5, 6, 7, 8, 9)
2. W.Richard Stevens, Stephen A. Rago: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education / Prentice-Hall of India, 2005. (Chapters 7, 8, 9, 13, 15, 16)

16 **Advanced Topics In DBMS** Employability

Sub Code : 13MCA352
Hrs/Week : 04
Total Hours : 52

IA Marks : 50
Exam Hours : 03
Exam Marks : 100

Over view of Storage and Indexing, Disks and Files **7 Hours**

Data on external storage; File organizations and indexing; Index data structures; Comparison of file organizations; Indexes and performance tuning Memory hierarchy; RAID; Disk space management; Buffer manager; Files of records; Page formats and record formats.

Transaction Management **6 Hours**

Introduction to Transaction Processing; Transaction and System Concepts; Desirable Properties of Transactions; Characterizing Schedules based on Recoverability; Characterizing Schedules based on Serializability; Two-Phase Locking Techniques for Concurrency Control; Concurrency Control based on Timestamp Ordering; Multiversion Concurrency Control Techniques; Validation Concurrency Control Techniques;. Granularity of Data Items and Multiple Granularity Locking; Recovery Concepts, Recovery Techniques based on Deferred Update; Recovery Techniques based on Immediate Update; Shadow Paging; The ARIES Recovery Algorithms; Recovery in Multidatabase Systems; Database Backup and Recovery from Catastrophic Failures.

Tree Structured Indexing **7 Hours**

Intuition for tree indexes; Indexed sequential access method; B+trees, Search, Insert, Delete, Duplicates, B+tress in practice

Hash-Based Indexing **4 Hours**

Static hashing, Extendible hashing, Linear hashing, comparisons

Overview of Query Evaluation, External Sorting **5 Hours**

The system catalog, Introduction to operator evaluation; Algorithm for relational operations; Introduction to query optimization; Alternative plans; A motivating example; what a typical optimizer does. When does a DBMS sort data? A simple two-way merge sort; External merge sort

Evaluating Relational Operators **4 Hours**

The Selection operation; General selection conditions; The Projection operation; The Join operation; The Set operations; Aggregate operations; The impact of buffering.

A Typical Relational Query Optimizer **7 Hours**

Translating SQL queries in to Relational Algebra; Estimating the cost of a plan; Relational algebra equivalences; Enumeration of alternative plans; Nested sub-queries; other approaches to query optimization.

Physical Database Design and Tuning **6 Hours**

Introduction; Guidelines for index selection ,examples; Clustering and indexing; Indexes that enable index-only plans, Tools to assist in index selection; Overview of database tuning; Choices in tuning the conceptual schema; Choices in tuning queries and views; Impact of concurrency; DBMS benchmarking.

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More Recent Applications **6 Hours**

Mobile databases; Multimedia databases; Geographical Information Systems; Genome data management.

Text Books:

1. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems,3rd Edition, McGraw-Hill,2003, (Chapters 8,9,10,11,12,13.1 to 13.3, 14,15,20)
2. Elmasri and Navathe:Fundamentals of Database Systems,5th Edition, Pearson Education, 2007. (Chapter 30)

Reference Books:

1. Conolly and Begg: Database Systems,4th Edition, Pearson Education,2002.

Basics of MIS and E-Commerce

Subject Code: 13MCA353 **I.A. Marks : 50**
Hours/Week: 4 **Exam Hours : 3**
Total Hours: 52 **Exam Marks : 100**

Information and Knowledge **4 Hours**
Information concepts, classification of information, methods of data and information collection, value of information, information: A quality product, General model of a human as information processor, Knowledge,

Introduction of MIS **4 Hour**
MIS: Concept, Definition, Role of the MIS, Impact of MIS, MIS and the user, Management as a control system, MIS support to the management, Management effectiveness and MIS, Organization as system. MIS: organization effectiveness

Decision Making and DSS **4 Hours**
Decision making concepts; decision making process, decision-making by analytical modeling, Behavioral concepts in decision making, organizational decision-making, Decision structure, DSS components, Management reporting alternatives.

Electronic Business systems **5 Hours**
Enterprise business system – Introduction, cross-functional enterprise applications, real world case, Functional business system, - Introduction, marketing systems, sales force automation, CIM, HRM, online accounting system, Customer relationship management, ERP, Supply chain management (real world cases for the above)

Client Server Architecture and E-business Technology **8 Hours**
Client server architecture, implementation strategies, Introduction to E-business, model of E-business, internet and World Wide Web, Intranet/Extranet, Electronic, Impact of Web on Strategic management, Web enabled business management, MIS in Web environment.

E-Commerce Introduction **9 Hours**
Course overview; Introduction to e-commerce, E-commerce Business Models and Concepts, E-Commerce Infrastructure: The Internet and World Wide Web, Web design, JavaScript Internet Information Server (IIS); Personal Web Server (PWS),

E-Commerce techniques and Issues **9 Hours**
Introduction to Active Server Pages (ASP), Building an E-Commerce Web Site, E-Commerce Payment Systems, E-Commerce Marketing Techniques, Building product catalogue, Search product catalogue, Web Spider and search agent, Ethical, Social and Political Issues in E-Commerce

Internet Communication **9 Hours**
Transaction Systems, Shopping Carts, XML, E-Commerce Applications: Business-to-Consumer (B2C), Consumer-to-Consumer (C2C), Business-to-Business (B2B), Digital Government, Marketplaces, and Communities, Security and Encryption, Web Security.

Text Books:
1. Waman S Jhawadekar: Management Information System, 3rd Edition, Tata McGraw Hill

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2. James A O'Brien and George M Marakas: Management Information System, 7th Edition, Tata McGraw Hill, 2006,
3. Turban, Rainer, and Potter, Introduction to E-Commerce, second edition, 2003
4. H. M. Deitel, P. J. Deitel and T. R. Nieto, E-Business and E-Commerce: How to Programe, Prentice hall, 2001

Reference Books:

1. Henry Chan, Raymond Lee, Tharam Dillon, Elizabeth Chang: E-Commerce Fundamentals and Applications, Wile India Edition
2. Ralph M Stair and George W Reynolds: Principles of Information Systems, 7th Edition, Thomson, 2010 .
3. Steven Alter: Information Systems - The Foundation of E-Business, 4th Edition, Pearson Education, 2001
4. Rahul De, Managing Information Systems in Business, Government and Society, , Wiley India.

18 **Operations Research** Employability

Subject Code: 13MCA354 **I.A. Marks : 50**
Hours/Week : 4 **Exam Hours : 3**
Total Hours : 52 **Exam Marks : 100**

Introduction and Overview of the OR Modeling Approach **3 Hours**
The origin of OR, the nature of OR, the impact of OR, defining the problem and gathering data, Formulating a mathematical model, deriving solutions from the model, testing the model, preparing to apply the model, implementation .

Introduction to Linear Programming **6 Hours**
Formulation of linear programming problem (LPP), examples, Graphical solution, the LP Model, Special cases of Graphical method, assumptions of Linear Programming (LP), additional example

Solving LPP - the Simplex Method **14 Hours**
The essence of the simplex method, setting up the simplex method, algebra of the simplex method, the simplex method in tabular form, special cases in the simplex method, tie breaking in the simplex method, adopting to other model forms (Two Phase method, Big-M method), post optimality analysis.

Duality Theory and Sensitivity Analysis **9 Hours**
The essence of duality theory, economic interpretation of duality, primal dual relationship, adapting to other primal forms, the role of duality in sensitive analysis, the dual simplex method

Transportation and Assignment Problems **8 Hours**
The transportation problem, a stream line simplex method for the transportation problem, the assignment problem, a special algorithm for the assignment problem

PERT and CPM **6 Hours**
Network representation, Critical path (CPM) computations and PERT networks.

Game Theory **6 Hours**
The formulation of two persons, zero sum games, solving simple games- a prototype example, games with mixed strategies, graphical solution procedure, solving by linear programming, extensions

Text Books:

1. Frederick S.Hillier & Gerald J.Lieberman: Introduction to Operations Research, 8th Edition, Tata McGraw Hill, 2006. (Chapters 1.1-1.3, 2.1-2.6, 3.2-3.4, 4.1-4.7, 6.1-6.7, 7.1, 8.1-8.4, 13.1-3.4, 14.1-14.6)
2. Hamdy A Taha: Operations Research - An Introduction, 7th Edition, Pearson Education 2007 Chapter 6.6(except 6.6.3 and 6.6.4)

Reference Books:

1. Wayne L. Winston: Operations Research Applications and Algorithms, 4th Edition, Thomson Course Technology, 2003.
2. Theory and Problems of Operations Research, Richard Bronson and

Govindasami Naadimuthu, Schaum's Outline, Tata McGraw Hill, 2nd Edition, 1997.

19 **Principles of User Interface Design** Employability

Subject Code: 13MCA355 **I.A. Marks : 50**
Hours/Week: 4 **Exam Hours : 3**
Total Hours: 52 **Exam Marks : 100**

Introduction **8 Hours**

Usability of Interactive Systems: Introduction, Usability Goals and Measures, Usability Motivation, Universal Usability, Goals for our profession. Guideline, principles, and theories: Introduction, Guidelines, principles, Theories,

Development Processes **6 Hours**

Managing Design Processes: Introduction, Organizational Design to support Usability,
The Four Pillars of Design, Development methodologies: Ethnographic Observation, Participatory Design, Scenario Development, Social Impact statement for Early Design Review, Legal Issues.

Evaluating Interface Design **6 Hours**

Introduction, Expert Reviews, Usability Testing and Laboratories, Survey Instruments, Acceptance tests, Evaluation during Active Use, Controlled Psychologically Oriented Experiments

Interaction Styles **8 Hours**

Direct Manipulation and Virtual Environments: Introduction, Examples of Direct Manipulation, Discussion of direct manipulation, 3D Interfaces, Tele-operation, Virtual and Augmented Reality
Menu Selection, Form Filling and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combination of Multiple Menus, Content Organization, Fast Movement Through Menus, Data Entry With Menus, Form Filling, Dialog Boxes and Alternatives, Audio Menus and Menus for Small Displays

Command and Natural Languages **6 Hours**

Introduction, Command-organization functionality strategies and structure, Naming and Abbreviations, Natural Language in computing.
Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Speech and Auditory interfaces, Displays-Small and Large

Design Issues **6 Hours**

Quality of Service: Introduction, Models of Response-Time Impacts, Expectations and Attitudes, User Productivity, Variability in Response time, Frustrating Experiences
Balancing Function and Fashion: Introduction, Error Messages, Non-anthropomorphic Design, Display design, web page design, Window Design, Color

User Documentation and Online Help : **6 Hours**

Introduction, Online versus paper documentation, Reading from paper versus Displays, Shaping the content of the Manuals, Accessing the Documentation, Online Tutorials and animated demonstrations, Online Communities for User Assistance, The Development Process.

Information Search and Visualization **6 Hours**

Introduction, Search in Textual Documents and Database Querying, Multimedia document searches, Advanced filtering and Search Interfaces,
Information Visualization : Introduction, Data tyoe by task taxonomy, Challenges for information visualization.

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TextBooks

1. Ben Shneiderman, Plaisant, Cohen, Jacobs: Designing the User Interface, 5th Edition, Pearson ,Education, 2010

Reference Books

1. Alan Dix, Janet Finalay, Gregory D AbiwdmRussel Bealel: Human-Computer Interaction, III Edition, Pearson ,Education, 2008.
2. Eberts: User Interface Design, Prentice Hall, 1994
3. Wilber O Galitz: The Essential Guide to User Interface Design- An Introduction to GUI Design, Principles and Techniques, Wiley-Dreamtech India Pvt Ltd, 2011

20 Probability, Statistics & Numerical Techniques Employability

Subject Code: 13MCA356 **I.A. Marks : 50**
Hours/Week: 4 **Exam Hours : 3**
Total Hours : 52 **Exam Marks : 100**

Introduction **4Hours**
Motivation, Probability Models, Sample Space, Events, Algebra of Events, Probability Axioms, Combinatorial Problems, Conditional Probability, Independence of Events, Bayes Rules

Random Variables **18 Hours**
Introduction, Random variables types ,functions of random variables, Probability mass functions, The Probability distribution functions, cumulative distribution function, expected values of x, moments ,moment generating function , Discrete Distributions, binomial distribution, Poisson distribution, Geometric distribution, continuous distribution ,normal distribution, exponential distribution

Regression and Analysis of Variance **6 Hours**
Introduction, Least-squares Curve Fitting, The Coefficients of Determination, Confidence Intervals in Linear Regression, Trend Detection and Slop estimation, Correlation Analysis, Simple Non-Linear Regression.

Numerical methods for solving algebraic transcendental equations **6 Hours**
Introduction, bisection, Newton'Raphson

Matrices **12 Hours**
Elementary row operation, Rank of a matrix, consistency of system of linear equations Solutions of system linear equations – Gauss elimination, Gauss seidel iterative method

Numerical integration **6 hours**
Trapezoidal rule, Simpsons 1/3 rd rule Simpsons 3/8 th rule

Text Books

1. Kishore S Trivedi "Probability & Statistics with Reliability, Queuing and Computer Science Applications ", Wiley Publications, Section Edition, 2012.
2. Arnold O Allen, "Probability, Statistics and Queuing Theory with Computer Science Applications ", Second Edition, ELSEVIER Publications, 2012.
3. Numerical methods for Science and Engineering Computation 6th Edition – R.R. Jain, M.K. Jain, S.R.K Iyengar by New Age International Publications
4. Numerical Methods Using Matlab 3rd Edition – Lindfield by Elsevier Publications

Reference Books

1. Murray R.Spiegel, "Probability and Statistics", McGrawHill, Schaum's Outline Series
2. A.Papoulis and S.Unnikrishnan Pillai, " Probability, Random Variables and Stochastic Processes", McGrawHill 4th Edition.
3. Probabality and Statistics for Engineers and Scientists 8th Edition by Ronald E Walpole Sharon L. Myers, Keyire Ye
4. Numerical Methods for Science and Engineering Computation - S.S. Sastry by PHI Publications

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21

SEMESTER IV

ANALYSIS AND DESIGN OF ALGORITHMS

Employability

Sub Code : 13MCA41 | **IA Marks : 50**
Hrs/Week : 04 | **Exam Hours: 03**
Total Hours: 52 | **Exam Marks: 100**

Introduction, Fundamentals of the Analysis of Algorithm Efficiency, Brute Force **12 Hours**
Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Fundamental data Structures. Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples. Selection Sort and Bubble Sort, Sequential Search and String Matching.

Divide-and-Conquer **8 Hours**
Mergesort, Quicksort, Binary Search, Binary tree Traversals and related properties, Multiplication of large integers, Stressen's Matrix Multiplication

Decrease-and-Conquer **5 Hours**
Insertion Sort, Depth First and Breadth First Search, Topological sorting, Algorithms for Generating Combinatorial Objects

Space and Time Tradeoffs **6 Hours**
Sorting by Counting, Input Enhancement in String Matching, Hashing.

Dynamic Programming **5 Hours**
Computing a binomial coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions

Greedy Technique **4 Hours**
Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Knapsack

Limitations of Algorithm Power **12 Hours**
Lower-Bound Arguments, Decision Trees, P, NP and NP-Complete Problems

Text Books:

1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, Pearson Education, 2nd Edition.(Chapters 1.1-1.4, 2.1-2.5, 3.1, 3.2, 3.4, 4.1-4.5, 5.1-5.4, 6.1, 6.3, 6.4, 6.6, 7.1-7.3, 8.1, 8.2, 8.4, 9.1-9.4, 10.1-10.3, 11.1-11.3)

Reference Books:

1. Coremen T.H., Leiserson C.E., and Rivest R.L.: Introduction to Algorithms, PHI 1998.
2. Horowitz E., Sahani S., Rajasekharan S.: Computer Algorithms, Galgotia Publication 2001.
3. Michael T Goodrich and Roberto Tamassia : Algorithm Design, Wiley India
4. R C T Lee, S S Tseng, R C Chang, Y T Tsai : Introduction to Design and Analysis of Algorithms: A Strategic Approach, Tata McGraw Hill

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Advanced JAVA Programming

Employability

Subject Code: 13MCA42 | **I.A. Marks : 50**
Hours/Week : 4 | **Exam Hours: 3**
Total Hours : 52 | **Exam Marks: 100**

Servlets: **8 Hours**

Servlet Structure, Servlet packaging, HTMLbuilding utilities, Lifecycle, Single Thread model interface, Handling Client Request: Form Data, Handling Client Request: HTTP Request Headers. Generating server Response: HTTP Status codes, Generating server Response: HTTP Response Headers, Handling Cookies, Session Tracking.

JSP: **12Hours**

Overview of JSP Technology, Need of JSP, Benefits of JSP, Advantages of JSP, Basic syntax, Invoking java code with JSP scripting elements, creating Template Text, Invoking java code from JSP, Limiting java code in JSP, using jsp expressions, comparing servlets and jsp, writing scriptlets. For example Using Scriptlets to make parts of jsp conditional, using declarations, declaration example. Controlling the Structure of generated servlets: the JSP page directive, import attribute, session attribute, isElignore attribute, buffer and auto flush attributes, info attribute ,errorPage and is errorPage attributes, is Thread safe Attribute, extends attribute, language attribute, Including files and applets in jsp Pages, using java beans components in JSP documents

Java Beans & Annotations: **6 Hours**

Creating Packages, Interfaces, JAR files and Annotations. The core java API package, New java. Lang Sub package, Built-in Annotations. Working with Java Beans. Introspection, Customizers, creating java bean, manifest file, Bean Jar file, new bean, adding controls, Bean properties, Simple properties, Design Pattern events, creating bound properties, Bean Methods, Bean an Icon, Bean info class, Persistence ,Java Beans API.

JDBC: **8 Hours**

Talking to Database, Immediate Solutions, Essential JDBC program, using prepared Statement Object, Interactive SQL tool. JDBC in Action Result sets, Batch updates, Mapping, Basic JDBC data types, Advanced JDBC data types,
immediate solutions.

Introduction to EJB: **9 Hours**

The Problem domain, Breakup responsibilities, CodeSmart not hard, the Enterprise java bean specification. Components Types. Server Side Component Types, Session Beans, Message Driven Beans, Entity Beans, The Java Persistence Model. Container services. Dependency Injection, Concurrency, Instance pooling n caching, Transactions, security, Timers, Naming and object stores, Interoperability, Life Cycle Callbacks, Interceptors, platform integration. Developing your first EJB. preparation, Definitions, naming conventions, convention for the Examples, coding the EJB, the contract, the bean Implementation class, out of Container Testing, Integration Testing.

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Server Side Component Models: **9 Hours**

The Stateless Session Bean, the Stateful Session Bean, the Singleton Session Bean, Message- Driven Beans. EJB and PERSISTENCE. Persistence Entity manager Mapping Persistence objects, Entity Relationships.

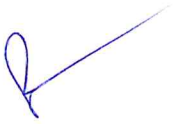
Text Books:

1. Marty Hall, Larry Brown. Core Servlets and Java Server Pages. Volume 1: Core Technologies. Second Edition. (Chapter 3,4,5,6,7,8,9,10,11,12,13,14).
2. Java 6 Programming Black Book, Dreamtech Press. 2012 (Chapter 17,18,19,20,21,22,27,28,29,30).
3. Andrew LeeRubinger, Bill Burke. Developing Enterprise Java Components. Enterprise JavaBeans 3.1.O'reilly. (Chapter 1,2,3,4,5,6,7,8,9,10,11).

Reference Books:

1. Michael Sikora, EJB 3 Developer Guide, A practical guide for developers and architects to the Enterprise Java Beans Standard, Shroff Publishers & Distributors PVT LTD. July 2008.

2. Herbert Schildt, Java The Complete Reference, Eight Edition. Comprehensive coverage of the Java Language. Tata McGraw-Hill Edition – 2011.



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23 **Advanced Web Programming** Employability

Subject Code : 13MCA43 **I.A. Marks : 50**
Hours/Week : 4 **Exam Hours : 3**
Total Hours : 52 **Exam Marks : 100**

1. Programming in Perl **7 Hours**
Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.

2. CGI Scripting **6 Hours**
What is CGI? Developing CGI Applications, Processing CGI, Introduction to CGI.pm, CGI.pm methods, Creating HTML Pages Dynamically, Using CGI.pm – An Example, Adding Robustness, Carp, Cookies

3. Building Web Applications with Perl **5 Hours**
Uploading files, Tracking users with Hidden Data, Using Relational Databases, using libwww,

4. Introduction to PHP **8 Hours**
Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files

5. Building Web applications with PHP **6 Hours**
Tracking users, cookies, sessions, Using Databases, Handling XML.

6. Introduction to Ruby **8 Hours**
Origins and uses of Ruby, Scalar types and their operations, Simple input and output, Control statements, Arrays, Hashes, Methods, Classes, Code blocks and iterators, Pattern matching.

7. Introduction to Rails **4 Hours**
Overview of Rails, Document requests, Processing forms, Rails applications with Databases, Layouts.

8. Introduction web 2.0, **4 Hours**
What is Web 2.0?, Folksonomies and Web 2.0, Software As a Service (SaaS), Data and Web 2.0, Convergence, Iterative development, Rich User experience, Multiple Delivery Channels, Social Networking.

9. Web Services **4 Hours**
Web Services: SOAP, RPC Style SOAP, Document style SOAP, WSDL, REST services, JSON format, What is JSON?, Array literals, Object literals, Mixing literals, JSON 0053yntax, JSON Encoding and Decoding, JSON versus XML.

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Text Books:

1. Chris Bates: Web Programming Building Internet Applications, 3rd Edn, Wiley India, 2006 (Chapter 10,11,13)
2. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2008. (Chapters 8,11,13, 14, 15)
3. Francis Shanahan: Mashups, Wiley India 2007(Chapters 1, 6)

Reference Books:

1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to H program, 3rdEdition, Pearson Education / PHI, 2004.
2. Xue Bai et al: The Web Warrior Guide to Web Programming, Thomson, 2003.
3. Joel Murach's PHP and MySQL. Mauch's Publications, First Edition.

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Advanced Computer Networks Employability

Subject Code: 13MCA441 **Internal Marks : 50**
Hours / Week: 4 **Exam Hours: 3**
Total Hours: 52 **External Marks: 100**

1 Introduction **2 Hours**
History of TCP/IP, TCP Applications and Services, Performance Study of TCP/IP, Meaning of TCP Performance?

2 TCP/IP Fundamentals **4 Hours**
TCP, TCP Services , Header Format, Encapsulation in IP, Acknowledgment Mechanism, Retransmission Mechanism, Connection Establishment and Termination, Control and Sliding Window, Congestion Control ,UDP ,UDP Services, Header Format ,Encapsulation in IP,IP Services, Fragmentation and Reassembly , Header Format and IP Version 6

3 Performance Measurement of TCP/IP Networks **3 Hours**
Reasons for Network Measurement, Measurement Tasks, Classification of Measurement Tools, Popular Measurement Tools and Their Applications, Tcpdump, Tcpstat, Ttcp & Netperf. Distributed Benchmark System

4 TCP/IP Network Simulation **4 Hours**
The Role of Simulation, Steps of a Systematic Simulation Study ,Types of Simulations, Continuous versus Discrete Event, Terminating versus Steady State, Synthetic versus Trace-Driven Simulation, Simulation Validation and Verification, Confidence Level of Simulation Results, Confidence Level Formula, Terminating Simulation, Steady-State Simulation, Common Simulation Mistakes, Simulation with Self-Similar Traffic. Network Simulators: Model Construction and Parameter Setting Data Collection, Simulation Execution, Presentation of Results and Examples of TCP/IP Simulation

5 TCP Modeling **5 Hours**
Motivation for Mathematical Modeling of TCP, Essentials of TCP Modeling, Window Dynamics Packet-Loss Process, Gallery of TCP Models, Periodic Model, Detailed Packet Loss Model, Stochastic Model with General Loss Process, Control System Model and Network System Model

6. TCP/IP Performance over Wireless Networks **3 Hours**
Wireless Networks: Generic Characteristics, Wireless Local Area Networks and Cellular Communications Networks. TCP Performance Issues over Wireless Links, Inappropriate Reduction of Congestion Window ,Throughput Loss in WLANs and Throughput Loss in Cellular Communication Systems .Improving TCP Performance over Wireless Links : Splitting TCP Connections ,Snooping TCP at Base Stations ,Notifying the Causes of Packet Loss , Adding Selective Acknowledgments to TCP and Comparison of Enhancement Schemes .Wireless System Evolution and TCP/IP :Trends in Cellular Communication Systems, Trends in Wireless LAN Systems, TCP/IP over Heterogeneous Wireless Systems

7. TCP/IP Performance over Mobile Networks **3 Hours**
Cellular and Ad Hoc Networks :TCP Performance in Cellular Networks, Mobile IP, Impact of Mobility on TCP Performance, Approaches to Improve TCP Performance ,TCP Performance in Ad Hoc Networks, Dynamic Source Routing ,Impact of Mobility on TCP Performance,

Approaches to Improve TCP Performance

8. TCP/IP Performance over Optical Networks **3 Hours**

Evolution of Optical Networks, IP over DWDM ,Multiprotocol Label Switching ,Multiprotocol Lambda Switching ,Optical Burst Switching ,Optical Packet Switching :Optical Packet Format, Congestion Resolution in Optical Packet Switches , Performance of TCP/IP over Optical Networks, Optical Packet Network End-to-End Performance, Mapping of TCP in Optical Packets, Optical Packet Design in the TCP/IP Environment

9. TCP/IP Performance over Satellite Networks **8 Hours**

A Brief History of Data Satellites, Motivations for Using Satellites,, ,Types of Satellites ,Satellite Internet Architectures ,Satellite Characteristics Affecting TCP :Long Feedback Loop, Link Impairment ,Bandwidth-Delay Product, Bandwidth Asymmetry ,Variable Delays ,LEO Handoff Spectral Congestion ,Security. TCP Enhancements for Satellite Networks :Path MTU Discovery ,TCP for Transactions, Window Scaling ,Large Initial Window, Byte Counting, Delayed ACKs after Slow Start ,Explicit Congestion Notification , Multiple Connections, Pacing TCP Segments , TCP/IP Header Compression, Security Issues Conclusions for TCP Enhancements. Advanced Enhancements and New Versions of TCP: Quick-Start TCP, High Speed TCP ,TCP Peach, Explicit Transport Error Notification TCP Westwood and XCP .New Transport Protocols for Satellite Links: Satellite Transport Protocol, Space Communications Protocol Specifications-Transport Protocol

10 TCP/IP Performance over Asymmetric Networks **3 Hours**

Types of Network Asymmetry: Bandwidth Asymmetry, Media-Access Asymmetry, Loss Rate. Asymmetry Impact of Asymmetry on TCP Performance: Bandwidth Asymmetry, Media-Access Asymmetry. Improving TCP Performance over Asymmetric Networks: Uplink Bandwidth Management Handling Infrequent ACK . Experimental Evaluation of Performance Improvement Techniques Experiments with Bandwidth Asymmetry, Experiments with Media-Access Asymmetry.

11. New TCP Standards and Flavors **3 Hours**

Duplicate Acknowledgments and Fast Retransmit, Fast Recovery and TCP Reno, TCP NewReno, TCP with Selective Acknowledgments, Forward Acknowledgments, TCP Vegas ,Overview of Other Features and Options and Performance Comparison of TCP Flavors

12 Active Queue Management in TCP/IP Networks **6 Hours**

Passive Queue Management: Tail-Drop, Drop-From-Front, Push-Out, Problems with Passive Queue Management, Active Queue Management: Random Early Detection, Classifying the RED Variants:

RED Variants with Aggregate Control, RED Variants with Per-Flow Accounting, Performance Evaluation and Comparison of AQM Schemes: Throughput and Fairness, Delay and Jitter, Time Response, Traffic Oscillation, Performance of AQM Schemes, AQM &Differentiated Service

13 TCP Implementation **5 Hours**

TCP Implementation Overview, Buffering and Data Movement, Accessing User Memory, TCP Data Exchange, Retransmissions, Congestion, High Performance TCP: High-Bandwidth-Delay Products Round-Trip Estimation, Path MTU Discovery ,Reducing End-System Overhead :Overhead, CPU Utilization, and Bandwidth , The Role of Application Processing, Sources of Overhead for TCP/IP, Per-Packet Overhead ,Interrupts, Checksums and Connection Management. Copy Avoidance: Page Remapping, Scatter/Gather I/O, Remote Direct Memory Access and TCP Offload.

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Text Book :

High Performance TCP/IP: Networking Concepts, Issues, and Solutions, Mahbub Hassan and Raj Jain, IST Edition, 2009 PHI Learning
Chapters 1,2,3,4,5,6,7,8,9,10,11,12,13 (excluding those topics which are not in the syllabus)

Reference Books:

TCP/IP Illustrated (Volume I, Volume II and Volume III), W. Richard Stevens, *Addison-Wesley*

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Data Warehousing and Data Mining

Employability

Subject Code : 13MCA442	**I.A. Marks : 50**
Hours/Week : 04	**Exam Hours : 03**
Total Hours : 52	**Exam Marks : 100**

Data Warehousing and OLAP **8 Hours**

Data Warehouse basic concepts, Data Warehouse Modeling, Data Cube and OLAP

Data Mining **6 Hours**

Introduction, What is Data Mining, Motivating Challenges, Data Mining Tasks, Which technologies are used, which kinds of applications are targeted by Data Mining

Data Mining **6 Hours**

Types of Data, Data Mining Applications, Data Preprocessing

Association Analysis: Basic Concepts and Algorithms **8 Hours**

Frequent Item set Generation, Rule Generation, Compact Representation of Frequent Item sets, Alternative methods for generating Frequent Item sets, FP Growth Algorithm, Evaluation of Association Patterns

Classification **12 Hours**

Basics, General approach to solve classification problem, Decision Trees, Rule Based Classifiers, Nearest Neighbor Classifiers. Bayesian Classifiers, Estimating Predictive accuracy of classification methods, Improving accuracy of clarification methods, Evaluation criteria for classification methods, Multiclass Problem.

Clustering Techniques **8 Hours**

Overview, Features of cluster analysis, Types of Data and Computing Distance, Types of Cluster Analysis Methods, Partitional Methods, Hierarchical Methods, Density Based Methods, Quality and Validity of Cluster Analysis

Outlier Analysis **4 Hours**

Outlier detection methods, Statistical Approaches, Clustering based applications, Classification based approached

Text Books:

1. Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Addison-Wesley, 2005.
2. G. K. Gupta: Introduction to Data Mining with Case Studies, 3rd Edition, PHI, New Delhi, 2009.

Reference Books:

1. Arun K Pujari: Data Mining Techniques University Press, 2nd Edition, 2009.
2. Jiawei Han and Micheline Kamber: Data Mining - Concepts and Techniques, 2nd Edition, Morgan Kaufmann Publisher, 2006.
3. Alex Berson and Stephen J. Smith: Data Warehousing, Data Mining, and OLAP Computing Mc GrawHill Publisher, 1997.

26 **Mobile Computing and Wireless Communications**

Subject Code: 13MCA443
Hours/Week: 04
Total Hours: 52

IA Marks : 50
Exam Hours : 03
Exam Marks : 100

Mobile Computing Architecture: **6 Hours**
Types of Networks, Architecture for Mobile Computing, 3-tier Architecture, Design Considerations for Mobile Computing,

Wireless Networks – 1: GSM and SMS **7 Hours**
Global Systems for Mobile Communication (GSM and Short Service Messages (SMS): GSM Architecture, Entities, Call routing in GSM, PLMN Interface, GSM Addresses and Identities, Network Aspects in GSM, Mobility Management, GSM Frequency allocation. Introduction to SMS, SMS Architecture, SM MT, SM MO, SMS as Information bearer, applications

Wireless Networks – 2: GPRS **6 Hours**
GPRS and Packet Data Network, GPRS Network Architecture, GPRS Network Operations, Data Services in GPRS, Applications for GPRS, Billing and Charging in GPRS

Wireless Networks – 3: CDMA, 3G and WiMAX **7 Hours**
Spread Spectrum technology, IS-95, CDMA versus GSM, Wireless Data, Third Generation Networks, Applications on 3G, Introduction to WiMAX.

Mobile Client **6 Hours**
Moving beyond desktop, Mobile handset overview, Mobile phones and their features, PDA, Design Constraints in applications for handheld devices. Mobile IP: Introduction, discovery, Registration, Tunneling, Cellular IP, Mobile IP with IPv6

Mobile OS and Computing Environment **7 Hours**
Smart Client Architecture, The Client: User Interface, Data Storage, Performance, Data Synchronization, Messaging. The Server: Data Synchronization, Enterprise Data Source, Messaging. Mobile Operating Systems: WinCE, Palm OS, Simian OS, Linux, Proprietary OS Client Development: The development process, Need analysis phase, Design phase, Implementation and Testing phase, Deployment phase, Development Tools, Device Emulators.

Building, Mobile Internet Applications **6 Hours**
Thin client: Architecture, the client, Middleware, messaging Servers, Processing a Wireless request, Wireless Applications Protocol (WAP) Overview, Wireless Languages: Markup Languages, HDML, WML, HTML, cHTML, XHTML, VoiceXML.

J2ME **7 Hours**
Introduction, CDC, CLDC, MIDP; Programming for CLDC, MIDlet model, Provisioning, MIDlet life-cycle, Creating new application, MIDlet event handling, GUI in MIDP, Low level GUI Components, Multimedia APIs; Communication in MIDP, Security Considerations in MIDP.

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Text Books:

1. Dr. Ashok Talukder, Ms Roopa Yavagal, Mr. Hasan Ahmed: Mobile Computing, Technology, Applications and Service Creation, 2d Edition, Tata McGraw Hill, 2010.
2. Martyn Mallik: Mobile and Wireless Design Essentials, Wiley, 2003.

Reference Books:

1. Raj kamal: Mobile Computing, Oxford University Press, 2007.
2. Iti Saha Misra: Wireless Communications and Networks, 3G and Beyond, Tata McGraw Hill, 2009.

27 **Software Testing and Practices** Employability

Sub. Code : 13MCA444
Hrs/Week : 4
Total Hours: 52

IA Marks: 50
Exam Hours: 03
Exam Marks : 100

Basics of Software Testing **7 hours**
Humans, Errors and Testing, Software Quality; Requirements, Behavior and Correctness, Correctness Vs Reliability; Testing and Debugging; Test Metrics; Software and Hardware Testing; Testing and Verification; Defect Management; Execution History; Test Generation Strategies; Static Testing; Test Generation from Predicates.

Basic Principles, Test case selection and Adequacy **6 hours**
Sensitivity, Redundancy, Restriction, Partition, Visibility and Feedback, Test Specification and cases, Adequacy Criteria, Comparing Criteria

A perspective on Testing, Examples **7 Hours**
Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Level of testing, Examples: Generalized pseudocode, The triangle problem, the NextDate function, The commission problem, The SATM (Simple Automation Teller Machine) problem, The currency converter, Saturn windshield wiper.

Boundary value testing, Equivalence class testing, Decision table based testing **7 Hours**
Boundary value analysis, Robustness testing, Worst-case testing, special value testing, Examples, Random testing, Equivalence classes, Equivalence test cases for triangle problem, NextDate function and commission problem, Guidelines and observations, Decision tables, Test cases for triangle problem.

Path Testing, Data flow testing **7 Hours**
DD Paths, Test coverage metrics, Basis path testing, guidelines and observations, Definition Use testing, Slice based testing, Guidelines and observations.

Levels of Testing, Integration Testing **6 Hours**
Traditional view of testing levels, Alternative life cycle models, the SATM systems, separating integration and system testing, Guidelines and observations.

Fault Based Testing **6 Hours**
Assumptions in fault-based testing, Mutation Analysis, Fault-based Adequacy Criteria; Variations on mutation Analysis; From Test case specification to Test Cases, Scaffolding, Generic vs specific Scaffolding, Test Oracles, Self checks as oracles, Capture and Replay.

Planning and Monitoring the Process, Documenting Analysis and Test **6 Hours**
Quality and Process, Test and Analysis strategies and plans, Risk Planning, Monitoring the Process, Improving the process, The quality team, Organizing documents, Test strategy document, Analysis and test plan, Test design specifications documents, Test and analysis reports.

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Text Books

1. Adithya P.Mathur " Foundations of Software Testing – Fundamental Algorithms and Techniques", Pearson Education India, 2011
2. MauroPezze, Michael Young, Software testing and Analysis- Process, Principles and Techniques, Wiley India, 2012
3. Paul C Jourgensen, "Software Testing A Craftmans Approach", Aueredach publications, 3rd edition, 2011.

Reference Books

1. Kshirasagara Naik, Priyadarshi Tripathy: Software Testing and Quality Assurance, Wiley India 2012
2. M.G.Limaye: Software Testing-Principels, Techniques and Tools – McGrawHill, 2009
3. Brain Marick: The Craft of Software Testing, Pearson Education India, 2008
4. Ron Patton: Software Testing, 2nd Edition, Pearson Education, India, 2013
5. Rahul Shende, , "Software Automation testing tools for Beginners". Shroff publishers and distributors, 2012

28 Employability

Theory of Computation (Finite Automata and Formal Languages)

Subject Code: 13MCA445 **IA Marks : 50**
Hours/Week: 04 **Exam Hours : 03**
Total Hours : 52 **Exam Marks: 100**

Introduction and Finite Automata: **10 Hours**

What is (not) a computer, The idea of computing, Computing Machines and Languages, What is the Science of Computing, Programming. Data Structures, Algorithms and Science, Birth of Science computing, Computability, Undecideability, Intractability and Intelligence, Why Study Science computing and Key Ideas, Automata- The idea of computing Machine, Automata Definition, Constructing Simple Automata, Handling End Condition, Handling Reject States, A Step-by-Step model for constructing Automata, States as Memory, Why Finite number of states, Constructing more complex Automata, Mantras for constructing Automata, Limitations of Finite Automata, Automata with Combinatorial States

NFA and Regular Expression **7 Hours**

The idea of Non-Determinism, Constructing Non-Deterministic Automata, Eliminating Non-Deterministic: converting NFA to DFA, Jumping States without Input, A method for minimizing Automata, Finite State Transducers, The idea of formal languages, Languages of Automata, Regular Expression, Constructing Regular Expressions, Converting Regular Expressions to Automata, Equivalence of Regular Expressions, Method for Constructing Regular Expressions, Regular Expressions in Practice

Regular Grammars and Languages **7 Hours**

The idea of Grammar, The ideas of parsing and Derivation, Grammars for Regular Languages, Constructing Regular Grammars, converting automata to regular grammars, converting regular grammars to automata, constructing regular grammars: mantras, Closure properties, Answering questions about regular languages, Why are some languages not regular, The Pigeonhole Principle and Pumping Lemma, Using Pumping Lemma an Adversarial Game.

Context Free Grammars **7 Hours**

The idea and nature of context free grammar, Constructing Context free grammars (LGs and Non LGs), Introduction to Parsing, Ambiguity and Eliminating ambiguity, The idea of Chomsky normal form, Converting to Chomsky normal form, The ideas of Griebach Normal form, Simple Linear and other grammars.

Pushdown Automata and Nature of Context Free Languages **7 Hours**

Machines for Context Free Languages, Adding Memory: Why Stack Behavior, Constructing PDAs, Constructing CFGs to PDAs, Converting PDAs to CFGs, Non-determinism in PDAs, The CFL-CFG-PDA Triad, Closure Properties, Union of CFLs, Answering Questions about CFLs, Why are some languages not context-free, The pumping lemma for context free languages.

Turing Machines **8 Hours**

The ideas of Universal Computing Machine, Constructing simple Turing machines, Constructing more complex Turing machines, Mantras for Constructing Turing Machines, The ideas of computation, computable functions, The Church-Turing Thesis, Variations of Turing Machines, The Universal Turing Machine

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The Chmosky Hierarchy **6 Hours**

Languages, Grammars and Machines, Recursively Enumerable Languages, Counting Alphabets, Languages and Computing Machines, The idea of Enumeration, The idea of Diagnoalization, The ideas of Acceptance and Membership, Recursive Languages, Context Sensitive Languages and Grammars, The ideas of context, Other Grammars and Automata, Linear and Deterministic Context-Free Langauges.

Text Books:

1. Kavi Mahesh: Theory of Computation: A problem solving approach, Wiley India, 2012

Reference Books:

1. A. M. Padma Reddy, Finite Automata and Formal Languages: A simple Approach, Pearson Education India, 2010
2. Introduction to Automata Theory, Languages, and Computation, Addison Wesley Publishing company, 2010
3. Aho & Ulman:Theory of computation, Pearson Education.

Digital Image processing

Employability

Subject Code : 13MCA446 | **IA Marks : 50**
Hrs/Week : 04 | **Exam Hours: 03**
Total Hrs. : 52 | **Exam Marks: 100**

UNIT 1: Introduction **10 Hours**

What Is Digital Image Processing? The Origins of Digital Image Processing. Examples of Fields that Use Digital Image Processing. Fundamental Steps in Digital Image Processing. Components of an Image Processing System. Image Sampling and Quantization. Some Basic Relationships Between Pixels. Linear and Nonlinear Operations.

UNIT 2: Image Enhancement in the Spatial Domain **8 hours**

Some Basic Gray Level Transformations. Histogram Processing. Enhancement Using Arithmetic/Logic Operations. Basics of Spatial Filtering. Smoothing Spatial Filters. Sharpening Spatial Filters. Combining Spatial Enhancement Methods.

UNIT 2: Image Enhancement in the Frequency Domain **8 hours**

Introduction to the Fourier Transform and the Frequency Domain. Smoothing Frequency-Domain Filters. Sharpening Frequency Domain Filters. Homo-morphic Filtering.

UNIT 4: Morphological Image Processing and Image Segmentation **10 Hours**

Dilation and erosion, opening and closing, Hit-or-Miss transformations, basic morphological algorithms, Detection of discontinues, edge linking and boundary detection, thresh holding, region –based segmentation.

UNIT 5: Representation and Descriptors **8 Hours**

Representation. Boundary Descriptors. Regional Descriptors. Use of Principal Components for Description. Relational Descriptors.

UNIT 6: Use of Image Processing in Pattern Recognition **8 Hours**

Introduction to the tools of Matlab and Open CV. Case study on Object Identification, Biometrics and Content Based Image retrieval.

Text Books:

1. Rafael C Gonzalez and Richard E Woods, Digital Image Processing, Pearson Education, 2002.
2. Anil K Jain, Fundamental of Digital Image Processing, Prentice Hall of India, 2004.

Reference Books:

1. William K Pratt, Digital Image Processing PIKS Scientific Inside, 4th Edition, Wiley
2. Vipul Singh, Digital Image Processing With Matlab & LabView, Reed Elsevier India Pvt Ltd, 2013.

Cryptography & Network Security

Subject Code: 13MCA451 | **I.A. Marks : 50**
Hours/Week: 04 | **Exam Hours: 03**
Total Hours: 52 | **Exam Marks : 100**

Introduction **3 Hours**
OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, Model for Network Security.

Classical Encryption Technique **5 Hours**
Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.

Block Ciphers, Data Encryption Standard and Advanced Encryption Standard **8 Hours**
Block Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles and Modes of operation, Evaluation Criteria for AES, AES Cipher-Encryption and Decryption, Data Structure, Encryption Round.

Public Key Cryptography and Key Management **6 Hours**
Principles of Public Key Cryptosystem, RSA algorithm, Key management, Diffie Hellman Key exchange

Message Authentication and Hash Function **6 Hours**
Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard

Authentication Applications **5 Hours**
Kerberos, X.509 Authentication Service

Electronic Mail Security **5 Hours**
Pretty Good Privacy (PGP), S/MIME

IP Security **5 Hours**
IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.

Web Security **5 Hours**
Web security Considerations; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET)

System Security **4 Hours**
Intruders; Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration.

Text Books:

William Stallings, "Cryptography and Network Security – Principles and Practices", 4th Edition, Pearson Education, 2009. (Chapters: 1, 2.1-2.3, 3.1,3.2,3.5, 5.1,5.2, 6.2, 9.1,9.2, 10.1,10.2, 11.1-11.4, 13.1, 13.3, 14.1, 4.2, 15.1, 15.2, 16.1-16.6, 17.1-17.3, 18.1, 18.2, 20.1; Exclude the topic not mentioned in the syllabus)

Reference Book:

1.Behrouz A. Forouzan and Debdeep Mukhopadhyay: "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill, 2010.
2.Atul Kahate, "Cryptography and Network Security" 2nd Edition TMH.

12 **NOSQL** – Employability

Subject Code:: 13MCA453 **I.A. Marks : 50**
Hours/Week 03 **Exam Hours : 3**
Total Hours : 52 **Exam Marks : 100**

Introduction to NOSQL **6 Hours**
Definition of NOSQL, History of NOSQL and Different NOSQL products, Exploring MondoDB Java/Ruby/Python, Interfacing and Interacting with NOSQL

NOSQL **Basics** **12 Hours**
NOSQL Storage Architecture, CRUD operations with MongoDB, Querying, Modifying and Managing NOSQL Data stores, Indexing and ordering datasets (MongoDB/CouchDB/Cassandra)

Advanced NOSQL **8 Hours**
NOSQL in CLOUD, Parallel Processing with Map Reduce, BigData with Hive

Working with NOSQL **10 Hours**
Surveying Database Internals, Migrating from RDBMS to NOSQL, Web Frameworks and NOSQL, using MySQL as a NOSQL

Developing Web Application with NOSQL **and** NOSQL **Administration** **16 Hours**
Php and MongoDB, Python and MongoDB, Creating Blog Application with PHP, NOSQL Database Administration

Text Books

1. "Professional NOSQL" by Shashank Tiwari, 2011, WROX Press (Chapter 1,2,3,4,5,6,7, 8, 9,10.11.12.13.15)
2. The Definitive guide to MongoDB, The NoSQL Database for Cloud and Desktop Computing, Apress 2010 (Chapter 6,7,8,9)

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Software Architectures

Subject Code :	**13MCA454**	**IA. Marks**	**: 50**
Hours/Week:	**4**	**Exam Hours**	**: 3**
Total Hours :	**52**	**Exam Marks**	**: 100**

Introduction **06 Hours**

What software architecture is and what it is not; Architectural Structures and views; Architectural patterns; What makes a "good" architecture? Why is software important?

Context of Software Architecture **04 Hours**

Technical Context; Project life-cycle context; Business context; Professional context; Stake holders; How is Architecture influenced? What Do Architecture influence?

Understanding Quality Attributes **12 Hours**

Architecture & Requirements; Functionality; quality attribute considerations; Specifying and achieving Quality attribute requirements; Guiding quality design decisions; Availability; Interoperability; Modifiability; Performance; Security; Testability; Usability

Quality Attribute modeling and Analysis **06 Hours**

Modeling Architecture to enable quality attribute analysis; Quality attribute check lists; Through experiments and Back-of-the envelope analysis; Experiments; Simulations and prototypes; Analysis at different stages of the life cycle

Architecture and requirements **06 Hours**

Gathering ASRs from requirements documents; ASRs by interviewing stake holders; ASRs by understanding the business; capturing ASRs in a utility tree; Typing the methods together

Designing an Architecture **03 Hours**

Design strategy; the attribute driven design methods; the steps of ADD

Documenting Software Architecture **06 Hours**

Uses and Audiences for architecture documentation; Notations, View and Behavior; Documentation and quality attributes

Architecture, Implementation & Testing **03 Hours**

Architecture and implementation; Architecture and testing

Architectural Patterns **06 Hours**

Introduction to patterns; From Mud to structure; Layers; Pipes and filters; Blackboard; Distributed systems; Brocker; Interactive systems; Model-view-control; Presentation-abstraction- control; Adaptable systems; Microkernel

Text Books:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 3d Edition, Pearson Education, 2013 (Listed Topics only from Chapters 1,2,3,4,5,6,7,8,9,10,11,14,16,17,18,19)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern- Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2012 (chapter 2)

Reference Books:

1. Richard N. Taylor, Nenad Medvidovic and Eric M. Dashofy: Software Architecture: Foundations, Theory, and Practice, Wiley- India 2012
2. Mary Shaw and David Garlan: Software Architecture-Perspectives on an Emerging Discipline, Prentice Hall of India, 2007.

34 **Enterprise Resource Planning** Entrepreneurship

Subject Code : 13MCA455 **I.A. Marks : 50**
Hours/Week : 4 **Exam Hours : 3**
Total Hours : 52 **Exam Marks : 100**

Unit I Introduction To ERP **9 Hours**

Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering, Data Warehousing, Data Mining, On–line Analytical Processing, Supply Chain Management.

Unit II ERP Implementation **12 Hours**

Implementation Life Cycle, Implementation Methodology ,Hidden Costs, Organizing Implementation ,Vendors,Consultants and Users ,Contracts , Project Management and Monitoring.

Unit III Business Modules **10 Hours**

Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution.

Unit IV ERP Market **10 Hours**

ERP Market Place, SAP AG, PeopleSoft ,Baan Company , JD Edwards World Solutions Company, Oracle Corporation ,QAD , System Software Associates.

Unit V ERP – Present And Future **11 Hours**

Turbo Charge the ERP System , EIA, ERP and E–Commerce , ERP and Internet, Future Directions in ERP.

TextBooks

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill, 1999.
2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner, "Concepts in Enterprise Resource Planning", Thomson Learning, 2001.

Reference Books

1. Vinod Kumar Garg and N.K .Venkata Krishnan, "Enterprise Resource Planning concepts and Planning", Prentice Hall, 1998.
2. Jose Antonio Fernandz, " The SAP R /3 Hand book", Tata McGraw Hill

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25 **Mobile Applications** Employability

Subject Code: 13MCA456 **I.A. Marks : 50**
Hours/Week : 04 **Exam Hours: 03**
Total Hours : 52 **Exam Marks: 100**

Foundation **6 Hours**

Mobile devices vs. desktop devices; ARM and intel architectures, Power Management, Screen resolution, Touch interfaces, Application deployment (App Store, Google Play, Windows Store); Native vs. web applications

Frameworks and Tools **10 Hours**

Development Environments (XCode, Eclipse, VS2012, PhoneGAP, etc.); Development Tools (HTML5, CSS, JavaScript, JQuery); Mobile-specific enhancements (Browser-detection, Touch interfaces, Geolocation, Screen orientation); Mobile browser "interpretations" (Chrome/Safari/Gecko/IE).

Mobile OS Architectures **8 Hours**

Mobile OS Architectures (Android, iOS, Windows); Mobile OS (Darwin, Linux, Windows); Runtime Environments (Objective-C, Dalvik, winRT), Mobile Agents and Peer-to-Peer Architecture

Performance Management **6 Hours**

Memory Management, Power Management, Security, Synchronization and Replication of Mobile Data, Getting the Model right, Storing and Retrieving Data

Developing an Application **8 Hours**

Building a simple "Hello World" App (Android, iOS, Windows); App-structure, built-in Controls, file access, basic graphics; Building useful apps; Database, Network, File access; Packaging and Deployment

System-level Apps **6 Hours**

Native programming (Android), Low-level programming (iOS), Low-level APIs (Windows).

Advanced Topics:Power Management,Augmented Reality,Mobile Device Security 8 Hrs

Wake locks and assertions, Low-level OS support, Writing power-smart applications, GPS , Accelerometer, Camera, Mobile malware, Device protections, Rooting (Android), Jailbreaking (iOS), Defenestration (Windows)

Text Books:

1 Jeff McWherter, Scott Gowell: Professional Mobile Application Development, John Wiley & Sons, Aug 2012
2 Reto Meier: Professional Android 4 Application Development, Wrox Publications, 2012
3 HTML5, CSS3 and Jquery with Adobe Dreamweaver CS 5.5 Learn by Video, David Powers, Richard, Trade paperback, Peachpit Press, 2011

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References:

1. Valentino Lee, Heather Schnerider, Robbie Schell: Mobile Applications: Architecture, Design and Development, Prentice Hall, 2004
2. Rajkamal: Mobile Computing, Oxford University Press, 2007.
3. Wallace B McClure, Nathan Blevins, John J. Croft IV, Jonathan Dick, Chris Hardy : Professional Android Programming with Mono for Android and .NET/C#, Wiley-India.
4. Reto Meier : Professional Android 4 Application Development, Wiley-India

Algorithms Laboratory

Subject Code : 13MCA46 | **I.A Marks : 50**
Hours/Week : 3 | **Exam Marks : 50**
Total Hours : 42 | **Exam Hours : 3**

Implement the following using C/C++ Language.

1. Implement Recursive Binary search and Linear search and determine the time required to search an element. Repeat the experiment for different values of n, the number of elements in the list to be searched and plot a graph of the time taken versus n.

2. Sort a given set of elements using the Heapsort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

3. Sort a given set of elements using Merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

4. Obtain the Topological ordering of vertices in a given igraph.

5. Implement 0/1 Knapsack problem using dynamic programming.

6. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

7. Sort a given set of elements using Quick sort method and determine the time required sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

8. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

9. Print all the nodes reachable from a given starting node in a digraph using BFS method.

10. Check whether a given graph is connected or not using DFS method.

11. Find a subset of a given set S = {sl,s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions{1,2,6}and{1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

12. a. Implement Horspool algorithm for String Matching.
    b. Find the Binomial Co-efficient using Dynamic Programming.

13. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.

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Mini Project-I Guidelines

Subject Code : 13MCA48
Hours/week : 3
Total Hours : 42

IA Marks : 50
Exam Hours : 03
Exam Marks : 50

PART A

1. Write a perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.
2. Create XHTML form with Name, address line1, address line2 and email text fields. On submitting, store the values in MySQL table. Retrieve and display the data based on name.
3. Write a PHP program to read student data from an XML file and store into the MySQL database. Retrieve and display using SEARCH function.
4. Build a Rails application to accept book information viz. accession number, title, authors, edition and publisher from a web page and store the information in a database and to search for a book with the title specified by the user and to display the search results with proper headings.

PART B

Develop a web application project using the languages and concepts learnt in the theory and exercises listed in part A with a good look and feel effects. You can use any web technologies and frameworks and databases.

Note:

1. In the examination each student picks one question from part A.
2. A team of two or three students must develop the mini project. However during the examination, each student must demonstrate the project individually.
3. The team must submit a brief project report (25-30 pages) that must include the following

   a. Introduction
   b. Requirement Analysis
   c. Software Requirement Specification
   d. Analysis and Design
   e. Implementation
   f. Testing
4. The report must be evaluated for 10 Marks. Demonstration and Viva for 20 Marks.

Instructions:

1. In the examination, one exercise from part A is to be asked for 20 marks.
2. Mini project student group size is limited to two students only.
3. The mini project under part B has to be evaluated for 30 marks.
4. Project report duly signed by the Guide and HOD need to be submitted during examination.

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SEMESTER V

Object-Oriented Modeling and Design Patterns

Employability

Subject Code: 13MCA51 | **I.A. Marks : 50**
Hours/Week: 4 | **Exam Hours: 3**
Total Hours: 52 | **Exam Marks: 100**

1. Introduction, Modeling Concepts **3 Hrs**

What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history. Modeling as Design Technique: Modeling; abstraction; The three models.

2. Class Modeling and Advanced Class Modeling: **7 Hrs**

Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips. Advanced object and class concepts; Association ends; N-array associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips

3. State Modeling and Advanced State Modeling **6 Hrs**

State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips. Advanced State Modeling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips.

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4. Interaction Modeling and Advanced Interaction Modeling **4 Hrs**

Interaction Modeling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.

5. Process Overview, System Conception **3 Hrs**

Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; elaborating a concept; preparing a problem statement.

6. Domain Analysis and Application Analysis **8 Hrs**

Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis. Application Analysis: Application interaction model; Application class model; Application state model; adding operations.

7. System Design and Class Design **7Hrs**

Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example. Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recursing downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.

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8. Patterns **4 Hrs**

What is a pattern and what makes a pattern? Pattern categories; Relationships between

17 System Simulation and Modeling Employability

Subject Code: 13MCA52
Hours/Week: 04
Total Hours: 52

IA Marks : 50
Exam Hours : 03
Exam Marks : 100

Introduction **6 Hours**

When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete-Event System Simulation; Steps in a Simulation Study.

Statistical Models in Simulation **6 Hours**

Review of terminology and concepts; Random Variables, Probability Distribution, Probability distribution function, Useful statistical models; Discrete distributions; Continuous distributions; Poisson process; Empirical distributions.

Random-Number Generation, Random-Variate Generation **8 Hours**

Properties of random numbers; Generation of pseudo-random numbers; Techniques for generating random numbers; Tests for Random Numbers, Random-Variate Generation: Inverse transform technique; Acceptance-Rejection technique; Special properties.

Queuing Models **8 Hours**

Characteristics of queuing systems; Queuing notation Simulation Examples: Queuing, Inventory System

General Principles, Simulation Software **6 Hours**

Concepts in Discrete-Event Simulation: The Event-Scheduling / Time-Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing. Simulation in Java;

Input Modeling **6 Hours**

Data Collection; Identifying the distribution with data; Parameter estimation; Goodness of Fit Tests; Fitting a non-stationary Poisson process; Selecting input models without data; Multivariate and Time-Series input models, uniformity and independence, Chi-Square test, K-S Test.

Verification and Validation **6 Hours**

Verification, Calibration, and Validation; Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models.

Estimation of Absolute Performance & Computer System Simulation **6 Hours**

Types of simulations with respect to output analysis; Stochastic nature of output data; Absolute measures of performance and their estimation; Output analysis for terminating simulations; Output analysis for steady-state simulations.

patterns; Pattern description.

9. Design Patterns **10 Hrs**

Introduction, structural decomposition, Organization of work, Model View Controller; Communication Patterns: Forwarder-Receiver; Client-Dispatcher-Server; Publisher-Subscriber; Management Patterns: Command processor; Whole Part, Master Slave, View Handler;

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education / PHI, 2005. (Chapters 1 to 15)
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2006. (Chapters 1, 3)

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson, 2007.
2. Mark Priestley: Practical Object-Oriented Design with UML, 2nd Edition, Tata McGraw-Hill, 2003.
3. K. Barclay, J. Savage: Object-Oriented Design with UML and JAVA, Elsevier, 2008.
4. Booch, G., Rumbaugh, J., and Jacobson, I.: The Unified Modeling Language User Guide, 2nd Edition, Pearson, 2005.
5. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns-Elements of Reusable Object- Oriented Software, Addison-Wesley, 1995.
6. Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002.
7. Rumbaugh, Blaha, Premerhani, Eddy, Lorensen; Object Oriented Modeling and Design, PHI Latest Edition

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Text Books:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 5th Edition, Pearson, 2010. (Listed topics only from Chapters1 to 12)

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson / Prentice-Hall, 2006.
2. Averill M. Law: Simulation Modeling and Analysis,4th Edition, Tata McGraw-Hill, 2007.
3. Simulation 5ed Ross Elsevier
4. Theory of modeling and simulation, Zeiglar, Elsevier

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18

Programming Using C#.NET

Employability

Subject: 13MCA53
Hours/ Week: 04
Total Hours : 52

IA Marks: 50
Exam Hours: 03
Exam Marks: 100

Getting started with .NET Framework 4.0 **04 Hours**

Benefits of .NET Framework, Architecture of .NET Framework 4.0, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication Foundation, Widows Card Space and LINQ.

Introducing C# **06 Hours**

Need of C#, C# Pre-processor Directives, Creating a Simple C# Console Application, Identifiers and Keywords. Data Types, Variables and Constants: Value Types, Reference Types, Type Conversions, Boxing and Undoing, Variables and Constants. Expression and Operators: Operator Precedence, Using the ?? (Null Coalescing) Operator, Using the :: (Scope Resolution) Operator and Using the is and as Operators. Control Flow statements: Selection Statements, Iteration Statements and Jump Statements.

Namespaces, Classes, Objects and Structures **06 Hours**

Namespaces, The System namespace, Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Class Members. Properties: Read-only Property, Static Property, Accessibility of accessors and Anonymous types. Indexers, Structs: Syntax of a struct and Access Modifiers for structs.

Object- Oriented Programming **05 Hours**

Encapsulation: Encapsulation using accessors and mutators, Encapsulation using Properties. Inheritance: Inheritance and Constructors, Sealed Classes and Sealed Methods, Extension methods. Polymorphism: Compile time Polymorphism/ Overloading, Runtime Polymorphism/ Overriding. Abstraction: Abstract classes, Abstract methods, Interfaces: Syntax of Interfaces, Implementation of Interfaces and Inheritance.

Delegates and Events and Exception Handling **05 Hours**

Delegates: Creating and using Delegates, Muticasting with Delegates. Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers. Exception Handling: The try/catch/finally statement, Checked and Unchecked Statements.

Graphical User Interface with Windows Forms **10 Hours**

Introduction, Windows Forms, Event Handling: A Simple Event- Driven GUI, Visual Studio Generated GUI Code, Delegates and Event- Handling Mechanism, Another Way to Create Event Handlers, Locating Event Information. Control Properties and Layout, Labels, TextBoxes and Buttons, GroupBoxes and Panels, CheckBoxes and RadioButtons, ToolTips, Mouse-Event Handling, Keyboard-Event Handling. Menus, MonthhCalendor Control, Date TimePicker Control, LinkLabel Control, ListBox Control, CheckedListBox Control, ComboBox Control, TreeView Control, ListView Control, TabControl Control and Multiple Document Interface (MDI) Windows.

Data Access with ADO.NET **08 Hours**

Understanding ADO.NET: Describing the Architecture of ADO.NET, ADO>NET, ADO.NET Entity Framework. Creating Connection Strings: Syntax for Connection Strings. Creating a Connection to a Database: SQL Server Database, OLEDB Database, ODBC Data Source. Creating a Command Object. Working with DataAdapters: Creating DataSet from DataAdapter, Paging with DatyaAdapters, Updating with DataAdapters, Adding Multiple Tables to a DataSet, Creating Data View. Using DataReader to Work with Databases.

Web App Development with ASP.NET **08 Hours**

Introduction, Web Basics, Multitier Application Architecture, Your First Web Application: Building WebTime Application, Examining WEebTime.aspx's Code-Behind File, Standard Web Controls: Designing a Form, Validation Controls, Session Tracking: Cookies, Session Tracking with http Session State, Optaions.aspx :Selecting a Programming Language, ecommenations.aspx: Displaying Recommendations based on Session Values.

Case study: Database-Driven ASP.NET Guestbook, Building a Web Form that Displays Data from a Database, Modifying the Code-Behind File for the Guestbook Application, ASP.NET AJAX: Traditional Web Applications, Ajax Web Applications, Testing an ASP.NET Ajax application, the ASP.NET Ajax Control Toolkit. Case study: Password-Protected Books Database Application

Text Books:

1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiely- Dream Tech Press. (Chapters: 1,10,11,12,13,14 and 19).
2. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education. (Chapters: 14,15,19 an 27.3)

References Books:

1. Andrew Trolsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, Wiely-Appress.
2. Bart De Smet: C# 4.0 Unleashed, Pearson Education- SAMS Series.
3. Hebert Shildt: Programming in C# 4.0, Tata McGraw Hill.

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39 **Mobile and Adhoc Sensor Networks** Employability

Subject Code: 13MCA541 **I.A. Marks : 50**
Hours/Week : 4 **Exam Hours: 3**
Total Hours : 52 **Exam Marks: 100**

Unit I **12 Hours**

Mobile Ad-Hoc Networking with a View of 4G Wireless: Imperatives and Challenges, Off-the-Shelf Enables of Ad Hoc Networks, IEEE 802.11 in Ad Hoc Networks: Protocols, Performance and Open Issues, Scatternet Formation in Bluetooth Networks, Antenna Beam forming and Power Control for Ad Hoc Networks.

Unit II **10 Hours**

Topology Control in Wireless Ad Hoc Networks, Broadcasting and Activity Scheduling in Ad Hoc Networks, Location Discovery, Mobile Ad Hoc Networks (MANETs): Routing Technology for Dynamic, Wireless Networking, Routing Approaches in Mobile Ad Hoc Networks.

Unit III **10 Hours**

Energy-Efficient Communication in Ad Hoc Wireless Networks, Ad Hoc Networks Security, Self- Organized and Cooperative Ad Hoc Networking, Simulation and Modeling of Wireless, Mobile, and Ad Hoc Networks, Modeling Cross-Layering Interaction Using Inverse Optimization, Algorithmic Challenges in Ad Hoc Networks.

Unit IV **10 Hours**

Introduction and Overview of Wireless Sensor Networks: Applications of Wireless Sensor Networks, Examples of Category 1 WSN Applications, Another Taxonomy of WSN Technology. Basic Wireless Sensor Technology: Sensor Node Technology, Sensor Taxonomy, WN Operating Environment, WN Trends.

Unit V Text **10 Hours**

Wireless Transmission Technology and Systems: Radio Technology Primer, Available Wireless Technologies. Medium Access Control Protocols for Wireless Sensor Networks: Fundamentals of MAC Protocols, MAC Protocols for WSNs, Sensor-MAC Case Study, IEEE 802.15.4 LR-WPANs Standard Case Study.

Text Book:

1. "Adhoc and Sensor Networks" by Stefano Basagni, Silvia Giordano, Ivan Stojmenvic. IEEE Press, A John Wiley & Sons, Inc., Publication 2004.

References

1. Kazem Sohraby, Daniel Minoli, Taieb Znati. Wireless Sensor Networks, A John Wiley & Sons, Inc., Publication 2007

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40 **Parallel Computing** Employability

Subject Code : 13MCA542 **IA |Marks:50**
Hours / Week : 4 **Exam Hours: 3**
Total Hours : 52 **Exam Marks: 50**

1. Introduction to Parallel Computing **2 Hours**
Need of Performance, Building Parallel Systems, Why to Write Parallel Programs? How to Write Parallel Programs? Approach : Concurrent, Parallel, Distributed

2 Parallel Hardware and Parallel Software **4 Hours**
Background, Modifications to the von Neumann Model, Parallel Hardware, Parallel Software, Input and Output, Performance, Parallel Program Design and Writing and Running Parallel Programs

3 Distributed Memory Programming with MPI **10 Hours**
Getting Started, The Trapezoidal Rule in MPI, Dealing with I/O, Collective Communication, MPI Derived Data types, A Parallel Sorting Algorithm

4 Shared Memory Programming with Pthreads **12 Hours**
Processes, Threads and Pthreads, Hello, World program ,Matrix-Vector Multiplication, Critical Sections Busy-Waiting, Mutexes, Producer-Consumer Synchronization and Semaphores, Barriers and Condition Variables, Read-Write Locks, Caches, Cache-Coherence, and False Sharing and Thread-Safety

5 Shared Memory Programming with OpenMP **18 Hours**
Introduction to OpenMP, The Trapezoidal Rulem Scope of Variables, The Reduction Clause, The Parallel For Directive, More About Loops in OpenMP: Sorting, Scheduling Loops, Producers and Consumers, Caches, Cache-Coherence, and False Sharing and Thread-Safety

6 Parallel Program Development and Parallel Algorithms **6 Hours**
Two N-Body Solvers, Tree Search and Case Studies

Text Books:

1. **An introduction to parallel programming** by peter s. Pacheco. 2011.I Edition ,morgan kaufmann publishers

Reference Books :

1. **Using OpenMP**: Portable Shared Memory Parallel Programming ,Gabriele Jost and Ruud van der Pas The MIT Press (October 12, 2007)
2. **Using MPI** - 2nd Edition: Portable Parallel Programming with the Message Passing Interface,William Gropp and Ewing Lusk, 1999, 2nd edition, MIT Press
3. **Pthreads Programming**: A Posix Standard for Better Multiprocessing,Dick Buttlar, Jacqueline Farrell & Bradford Nichols .1996, I Edition , Oreilly

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41 **Multimedia Systems** Employability

Subject Code: 13MCA543
Hours/Week : 4
Total Hours : 52

I.A. Marks : 50
Exam Hours : 3
Exam Marks : 100

Introduction, Media and Data Streams, Audio Technology **7 Hours**

Multimedia Elements; Multimedia Applications; Multimedia Systems Architecture; Evolving Technologies for Multimedia Systems; Defining Objects for Multimedia Systems; Multimedia Data Interface Standards; The need for Data Compression; Multimedia Databases.

Media: Perception Media, Representation Media, Presentation Media, Storage Media, Transmission Media, Information Exchange Media, Presentation Spaces & Values, and Presentation Dimensions; Key Properties of a Multimedia System: Discrete & Continuous Media, Independence Media, Computer Controlled Systems, Integration; Characterizing Data Streams: Asynchronous Transmission Mode, Synchronous Transmission Mode, Isochronous Transmission Mode; Characterizing Continuous Media Data Streams.

Sound: Frequency, Amplitude, Sound Perception and Psychoacoustics; Audio Representation on Computers; Three Dimensional Sound Projection; Music and MIDI Standards; Speech Signals; Speech Output; Speech Input; Speech Transmission.

Graphics and Images, Video Technology, Computer-Based Animation **7 Hours**

Capturing Graphics and Images Computer Assisted Graphics and Image Processing; Reconstructing Images; Graphics and Image Output Options. Basics; Television Systems; Digitalization of Video Signals; Digital Television; Basic Concepts; Specification of Animations; Methods of Controlling Animation; Display of Animation; Transmission of Animation; Virtual Reality Modeling Language.

Data Compression **12 Hours**

Storage Space; Coding Requirements; Source, Entropy, and Hybrid Coding; Basic Compression Techniques; JPEG: Image Preparation, Lossy Sequential DCT-based Mode, Expanded Lossy DCT-based Mode, Lossless Mode, Hierarchical Mode. H.261 (Px64) and H.263: Image Preparation, Coding Algorithms, Data Stream, H.263+ and H.263L; MPEG: Video Encoding, Audio Coding, Data Stream, MPEG-2, MPEG-4, MPEG-7; Fractal Compression.

Optical Storage Media **6 Hours**

History of Optical Storage; Basic Technology; Video Discs and Other WORMs; Compact Disc Digital Audio; Compact Disc Read Only Memory; CD-ROM Extended Architecture; Further CD-ROM-Based Developments; Compact Disc Recordable; Compact Disc Magneto-Optical; Compact Disc Read/Write; Digital Versatile Disc.

Content Analysis **6 Hours**

Simple Vs. Complex Features; Analysis of Individual Images; Analysis of Image Sequences; Audio Analysis; Applications.

Data and File Format Standards **7 Hours**

Rich-Text Format; TIFF File Format; Resource Interchange File Format (RIFF); MIDI

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File Format; JPEG DIB File Format for Still and Motion Images; AVI Indeo File Format; MPEG Standards; TWAIN

Multimedia Application Design **7 Hours**

Multimedia Application Classes; Types of Multimedia Systems; Virtual Reality Design; Components of Multimedia Systems; Organizing Multimedia Databases; Application Workflow Design Issues; Distributed Application Design Issues.

Text Books:

1. Ralf Steinmetz, Klara Narstedt: Multimedia Fundamentals: Vol 1-Media Coding and Content Processing, 2nd Edition, Pearson Education, 2003. (Chapters 2, 3, 4, 5, 6, 7, 8, 9)
2. Prabhat K. Andleigh, Kiran Thakrar: Multimedia Systems Design, PHI, 2003. (Chapters 1, 3, 7)

Reference Books:

1. K.R Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic: Multimedia Communication Systems: Techniques, Standards, and Networks, Pearson Education, 2002.
2. Nalin K Sharad: Multimedia information Networking, PHI, 2002.

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42 **PATTERN RECOGNITION** Employability

Subject Code : 13MCA544
Hrs/Week : 04
Total no. of Lecture Hrs. : 52

IA Marks : 50
Exam Hours : 03
Exam Marks : 100

UNIT – 1 **8 Hours**

INTRODUCTION: Machine perception, pattern recognition systems, design cycle, learning and adaptation, Applications of pattern recognition.

UNIT – 2 **9 Hours**

PROBABILITY: Introduction, probability of events, random variables, Joint distributions and densities, moments of random variables, estimation of parameters from samples, minimum risk estimators.

UNIT – 3 **10 Hours**

STATISTICAL DECISION MAKING: Introduction, Baye's Theorem, multiple features, conditionally independent features, decision boundaries, unequal costs of error, estimation of error rates, the leavingone- out technique. Characteristic curves, estimating the composition of populations.

UNIT – 4 **9 Hours**

NONPARAMETRIC DECISION MAKING: Introduction, histograms, Kernel and window estimators, nearest neighbor classification techniques, adaptive decision boundaries, adaptive discriminate Functions, minimum squared error discriminate functions, choosing a decision making technique.

UNIT – 5 **8 Hours**

UNSUPERVISED LEARNING AND CLUSTERINGS: Unsupervised Bayesian learning, data decryption and clustering, criterion functions and clustering, Hierarchical clustering, Online clustering, component analysis.

UNIT – 6 **8 Hours**

ARTIFICIAL NEURAL NETWORKS: Introduction, nets without hidden layers. nets with hidden layers, the back Propagation algorithms, Hopfield nets, an application.

TEXT BOOKS:

1. **Pattern Classification** Duda R. O., and Hart P E., and Stork D G., Wiley Publishers
2. **Pattern Recognition and Image Analysis,** Earl Gose, Richard J and Steve J, PHI
3. **Pattern recognition** (Statistical, structural and Neural Approaches), Robert Schalkoff

REFERENCE BOOKS

1. **"Pattern Recognition,** Sergios Thedoridis & Konstantinos Koutrumbas, Elsevier Academic Press, 4th Edition.

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43 Service Oriented Architectures (SOA) Employability

Sub. Code: 13MCA545
Hrs/Week: 4
Total Hours: 52

IA Marks:50
Exam Hours:03
Exam Marks: 100

Introduction to SOA, Evolution of SOA **6 hours**

Fundamentals of SOA, Common characteristics of contemporary SOA, Common tangible benefits of SOA, A SOA timeline (from XML to Web Services to SOA), The continuing evolution of SOA (standards organizations and Contributing vendors), The roots of SOA (comparing SOA to Past Architectures)

Web Services and Primitives of SOA **6 hours**

The Web Services framework, Services (as Web Services), Service Description (with WSDL), Messaging (with SOAP)

Web Services and Contemporary SOA **12 Hours**

Message Exchange patterns, Service Activity; Coordination, Atomic Transactions, Business Activities, Orchestration, Choreography, Addressing, Reliable Messaging, Correlation, Policies, Meta data Exchange, Security, Notification and eventing.

Principles of Service – Orientation **7 Hours**

Services- Orientation and the enterprise, Anatomy of service-oriented Architecture, Common Principles of Service Orientation; How Service Orientation principles inter relate, Service Orientation and object orientation, Native Web Service support for service orientation principles.

Service Layers **6 Hours**

Service Orientation and contemporary SOA, Service Layer Abstraction, Application service layer, Business Service Layer, Orchestration Service Layer, Agnostic Services, Service Layer Configuration scenarios.

Business Process Design **7 Hours**

WS-BPEL Language basics, WS-Coordination overview, Service oriented business process redesign, WS-Addressing language basics, Ws-Reliable messaging language basics.

Enterprise Applications **8 Hours**

Learning Objectives, Architectural Considerations, Solution Architecture for Enterprise Applications, Solution Architecture for Enterprise Applications based on SOA, Software Platforms for Enterprise Applications.

Text Books

1. Thomas Erl: Service Oriented Architecture- Concepts, Technology and Design, Pearson Education, 2013 (listed topics only from Chapters 3,4,5,6,7,8,9,16,17)
2. Shankar Khambhapaty, Service Oriented Architecture for Enterprise and Cloud Applications, 2nd Edition, Wiley-India, 2012 (listed topics only from Chapter 5,6)

Reference Books

1. Frank cohen: FastSOA, Elsevier, 2010
2. Eric Newcomer, Greg Lomow: Understanding SOA with Web Services, Pearson Education, 2009.

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Compiler Design

Subject Code: 13MCA546 **IA Marks: 50**
Hours/ Week: 4 **Exam Hours: 3**
Total Hours: 52 **Exam Marks: 100**

Introduction, Lexical analysis **8 Hours**
Language processors; The structure of a Compilers; The evolution of programming languages; The science of building a compiler; Applications of Compiler technology; Programming language basics; Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.

Syntax Analysis - 1 **6 Hours**
Introduction; Context-free Grammars; Writing a Grammar; Top-down Parsing

Syntax Analysis – 2 **6 Hours**
Bottom-up Parsing; Introduction to LR Parsing: Simple LR.

Syntax Analysis – 3 **6 Hours**
More powerful LR parsers; Using ambiguous grammars; Parser Generators.

Syntax-Directed Translation **6 Hours**
Syntax-Directed definitions; Evaluation order for SDDs; Applications of Syntax-directed translation; Syntax-directed translation schemes

Intermediate Code Generation **8 Hours**
Variants of syntax trees; Three-address code; Types and declarations; Translation of expressions; Type checking; Control flow; Back patching; Switch statements; Intermediate code for procedures.

Run-Time Environments **6 Hours**
Storage Organization; Stack allocation of space; Access to non-local data on the stack; Heap management; Introduction to garbage collection

Code Generation **6 Hours**
Issues in the design of Code Generator; The Target language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator.

Text Books:

1. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D Ullman: Compilers-Principles, Techniques and Tools, 2nd Edition, Addison-Wesley, 2007. (Chapters 1, 3.1 to 3.4, 4, 5.1 to 5.4, 6, 7.1 to 7.5, 8.1 to 8.6)

Reference Books:

1. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson Education, 1991.
2. Andrew W Appel: Modern Compiler Implementation in C, Cambridge Univ. Press, 1997.
3. Kenneth C Louden: Compiler Construction, Principles & Practice, Thomson Education, 1997.

46

WEB 2.0 AND RICH INTERNET APPLICATIONS

Employability

SubCode: 13MCA552
Hrs/Week: 4
Total Hours:52

IAMarks:50
Exam Hours:3
Exam Marks:100

Building Rich Internet Applications with AJAX **6 Hours**

Building Rich Internet Applications with AJAX: Limitations of Classic Web application model, AJAX principles, Technologies behind AJAX, Examples of usage of AJAX, Dynamic web applications through Hidden frames for both GET and POST methods. IFrames, Asynchronous communication and AJAX application model.

Ajax with XMLHTTP object **6 Hours**

Creating Ajax Applications: An example, Analysis of example ajax.html, Creating the JavaScript, Creating and opening the XMLHttpRequest object, Data download, Displaying the fetched data, Connecting to the server, Adding Server-side programming, Sending data to the server using GET and POST.

Handling multiple XMLHttpRequest objects in the same page, Using two XMLHttpRequest objects, Using an array of XMLHttpRequest objects, Using inner functions, Downloading JavaScript, connecting to Google Suggest, Creating google.php, Downloading from other domains with Ajax, HTML header request and Ajax, Defeating caching, Examples.

Building XML and working with XML in JavaScript, Getting the document element, Accessing any XML element, Handling whitespace in Firefox, Handling cross-browser whitespace, Accessing XML data directly, Validating XML, Further examples of Rich Internet Applications with Ajax

Ajax Patterns **4 Hours**

Predictive fetch pattern, Submission throttling pattern, Periodic refresh, Multi stage download, Fall back patterns

Working with PHP and DOM in Ajax **6 Hours**

Working with PHP server variables, Getting the data in to array format, Wrapping applications in to a single PHP page, Validating input from the user, Validating integers and text, DOM, Appending new elements to a web page using the DOM and Ajax, Replacing elements using the DOM, Handling timeouts in Ajax, Downloading images with Ajax, Example programs.

Flex – 1: Understanding Flex Environment and Layouts **6 Hours**

Introduction: Understanding Flex Application Technologies, Using Flex Elements, Working with Data Services (Loading Data at Runtime), The Differences between Traditional and Flex Web Applications, Understanding How Flex Applications Work, Understanding Flex and Flash Authoring.Building Applications with the Flex Framework: Using Flex

Tool Sets, Creating Projects, Building Applications, Deploying Applications.
Framework Fundamentals: Understanding How Flex Applications Are Structured, Loading and Initializing Flex Applications, Understanding the Component Life Cycles, Loading One Flex Application into Another Flex Application, Differentiating Between Flash Player and the Flex Framework, Caching the Framework, Understanding Application Domains, Localization, Managing Layout: Flex Layout Overview, Making Fluid Interfaces, Putting It All Together.

Flex – 2: Working with MXML and ActionScript **8 Hours**

MXML: Understanding MXML Syntax and Structure, Making MXML Interactive Working with UI Components: Understanding UI Components, Buttons, Value Selectors, Text Components, List-Based Controls, Pop-Up Controls, Navigators, Control Bars Customizing Application.Appearance: Using Styles, Skinning components, Customizing the preloader, Themes, Runtime CSS ActionScript: Using ActionScript, MXML and ActionScript Correlations, Understanding ActionScript Syntax, Variables and Properties, Inheritance, Interfaces, Handling Events, Error
Handling, Using XML

Flex – 3: Working with States **6 Hours**

Managing State: Creating States, Applying States, Defining States, Adding and Removing Components, Setting Properties, Setting Styles, Setting Event Handlers, Using Action Scripts to Define States, Managing Object Creation Policies, Handling State Events, Understanding State Life Cycles, When To Use States. Using Effects and Transitions: Using Effects, Creating Custom Effects, Using Transitions, Creating Custom Transitions.

Flex – 4: Working with Data Models and Data Binding **4 Hours**

Working with Data: Using Data Models, Data Binding, Enabling Data Binding for Custom Classes, Data Binding Examples, Building data binding proxies. Validating and Formatting Data: Validating user input, Formatting Data.

Impacts of the Next Generation of the web **3 Hours**

Business models for Internet and web, Data Ownership, SAAS, Socialization and cocreation of content.

The Semantic web and Web 2.0 **3 Hours**

Overview of semantic web, Languages of the Semantic Web, Ontologies, Micro-formats, collaborative tagging and folksonomies.

Text Books:

1.Nicholas C Zakas et al: Professional AJAX, Wiley India, publications, (Chapters 1 to 3)
2. Steven Holzner: Ajax: A Beginner's Guide, Tata McGraw Hill, 2011. (Listed topics from Chapters 3, 4, 7, 11, 12)

Reference Books:

1. Chafic Kazon and Joey Lott: Programming Flex 3, O'Reilly, 2011. (Listed topics from Chapters 1 to 8, 12 to 15)
2. Gottfried Vossen and Stephan Hagemann: Unleashing Web 2.0 Elsevier, Inc 2011 (Listed topics from Chapters 5 and 6)

3. Thomas A. Powel: Ajax The Complete reference, McGraw Hill, 2008.
4. Gottfried Vossen, Stephan Hagemann: Unleashing Web 2.0 From Concepts to Creativity, Elsevier, 2007.
5. Colin Moock: Essential Actionscript 3.0, O'Reilly Publications, 2007.
6. Steven Holzner : Ajax Bible Wiley India , 2007.
7. Justin Gehtland et al: A Web 2.0 primer Pragmatic Ajax, SPD Publications, 2006.
8. Eric Van derVlist et al: Professional Web 2.0 Programming, Wiley India, 2007.

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Employability

Information Retrieval and Search Engines

Subject Code: 13MCA553 | **I.A.Marks :50**
Hours/Week: 4 | **Exam Hours : 3**
Total Hours: 52 | **Exam Marks: 100**

UNIT 1 INTRODUCTION **4 Hours**

Information Retrieval, Search Engines, Search Engineers.

UNIT 2 ARCHITECTURE OF A SEARCH ENGINE **5 Hours**

Architecture, Basic Building Blocks, Text Acquisition, Text Transformation Index Creation, User Interaction, Ranking and Evaluation

UNIT 3 CRAWLS AND FEEDS **6 Hours**

Deciding what to search, Crawling the Web, Directory Crawling, Document Feeds, Conversion Problem, Storing the Documents, Detecting Duplicates, removes noise.

UNIT 4 PROCESSING TEXT **8 Hours**

Text Statistics, Document Parsing, Document Structure and Markup, Link Analysis, Information Extraction, Internationalization

UNIT 5 RANKING WITH INDEXES **6 Hours**

Abstract Model of Ranking, Inverted indexes, Compression, Entropy and Ambiguity, Delta Encoding, Bit-aligned codes, Auxiliary Structures, Index Construction, Query Processing.

UNIT 6 QUERIES AND INTERFACES **5 Hours**

Information Needs and Queries ,Query Transformation and Refinement , Showing the Results Cross-Language Search.

UNIT 7 RETRIEVAL MODELS **12 Hours**

Overview of Retrieval Models , Boolean Retrieval , The Vector Space Model, Probabilistic Models, Information Retrieval as Classification, BM25 Ranking Algorithm, Complex Queries and Combining Evidence, Web Search, Machine Learning and Information Retrieval ,.

UNIT 8 EVALUATING SEARCH ENGINES **6 Hours**

The Evaluation Corpus , Logging , Effectiveness Metrics, Recall and Precision Averaging and Interpolation , Efficiency Metrics, Training, Testing, and Statistics

Text Books and References

1. **Search Engines: Information Retrieval in Practice:** Trevor Strohman, Bruce Croft Donald Metzler, Kindle **Edition**

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48

Soft Computing

Employability

Subject Code: 13MCA554
Hours/Week: 04
Total Hours: 52

I.A. Marks : 50
Exam Hours: 03
Exam Marks: 100

Genetic Algorithm: An Overview — **5 Hours**

History of Evolutionary Computing, The Appeal of Evolution, Biological Terminology, Elements of Genetic Algorithm, Genetic Algorithms and Traditional Search Methods, Applications and Examples of Genetic Algorithm.

Genetic Algorithm in Problem Solving — **5 Hours**

Evolving Computer Programs, Data Analysis and Prediction, Evolving Neural Networks.

Theoretical Foundations of Genetic Algorithm — **5 Hours**

Schemas and the Two-Armed Bandit Problem, Royal Roads, Exact Mathematical Models of Genetic Algorithm.

Implementing a Genetic Algorithm — **5 Hours**

When should a Genetic Algorithm be used , Encoding a Problem for a Genetic Algorithm, Adapting the Encoding, Selection Methods , Genetic Operators, Parameters for Genetic Algorithm.

Introduction to fuzzy set theory — **8 hours**

Probabilistic reasoning, Fuzzy sets, Mathematics of fuzzy set theory, Operations on fuzzy sets, Comparison of fuzzy and crisp set theory.

Fuzzy mapping — **6 Hours**

One to one mapping, Max-min principle, Extension principle, Implication rules – mamdani implications.

Membership functions — **8 Hours**

Universe of discourse, Mapping inside fuzzy domain, Fuzzy membership mapping methods, Application to real world problems.

Neural Networks and Fuzzy System — **6 Hours**

Neural and Fuzzy Machine Intelligence, Fuzziness as Multivalence, The Dynamical System Approach to Machine Intelligence: The Brain as a Dynamical System, Intelligent Behaviour as Adaptive Model Free estimation.

Neural Network Theory — **4 Hours**

Neuron as Functions, Signal Monotonicity, Biological Activations and Signals, Neuron Fields, Neuronal Dynamical System, Common Signal Functions, Pulse –Coded Signal Functions

Text Books:

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1. Melanie Mitchell: An Introduction to Genetic Algorithms, Prentice-Hall of India, India Edition, 2004. (Chapters: 1, 2, 4, 5 Exclude the topic not mentioned in the syllabus)
2. Timothy J. Ross : Fuzzy logic to engineering applications , McGraw Hill Inc, India Edition
3. Bart Kosko: Neural Networks and Fuzzy Systems – A Dynamical Systems Approach to Machine Intelligence, PHI Learning, India Edition, 2009. (Chapters: 1 and 2)

Reference Book:

1. D.E. Goldberg, Genetic Algorithms in Search, Optimization and Machine Learning, Addison-Wesley,1989.
2. Z. Michalewicz , Genetic Algorithms + Data Structures = Evolution Programs, Springer-Verlag,1994.
3. N.K. Sinha & M.M Gupta(Eds), Soft Computing & Intelligent System: Theory & Applications, Academic Press, 2000.
4. M.T. Hagan, H.B. Demuth and M. Beale, Neural Network Design, Thompson Learning,1996.
5. S.N Sivanandam, S.N Deepa, Principles of Soft Computing, 2nd Edition, Wiley

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49

Storage Area Networks

Employability

Subject Code: 10MCA555 **I.A. Marks : 50**
Hours/Week : 04 **Exam Hours: 03**
Total Hours : 52 **Exam Marks: 100**

Introduction to Information Storage and Management, Storage System Environment 7 Hours

Information Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle Components of Storage System Environment, Disk Drive Components, Disk Drive Performance, Fundamental Laws Governing Disk Performance, Logical Components of the Host, Application Requirements and Disk Performance.

Data Protection, Intelligent Storage system **6 Hours**

Implementation of RAID, RAID Array Components, RAID Levels, RAID Comparison, RAID Impact on Disk Performance, Hot Spares Components of an Intelligent Storage System, Intelligent Storage Array

Direct-Attached Storage, SCSI, and Storage Area Networks **7 Hours**

Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, Overview of Fibre Channel, The SAN and Its Evolution, Components of SAN, FC Connectivity, Fibre Channel Ports, Fibre Channel Architecture, Zoning, Fibre Channel Login Types, FC Topologies.

NAS, IP SAN **6 Hours**

General – Purpose Service vs. NAS Devices, Benefits of NAS, NAS File I / O, Components of NAS, NAS Implementations, NAS File-Sharing Protocols, NAS I/O Operations, Factors Affecting NAS Performance and Availability. iSCSI, FCIP.

Content-Addressed Storage, Storage Virtualization **6 Hours**

Fixed Content and Archives, Types of Archive, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS, CAS Examples. Forms of Virtualization, SNIA Storage Virtualization Taxonomy, Storage Virtualizations Configurations, Storage Virtualization Challenges, Types of Storage Virtualization,

Business Continuity, Backup and Recovery **6 Hours**

Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis, Business Impact Analysis, BC Technology Solutions. Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Process, Backup and restore Operations, Backup Topologies, Backup in NAS Environments, Backup Technologies.

Local Replication, Remote Replication **7 Hours**

Source and Target, Uses of Local Replicas, Data Consistency, Local Replication Technologies, Restore and Restart Considerations, Creating Multiple Replicas, Management Interface, Modes of Remote Replication, Remote Replication Technologies, Network Infrastructure.

Securing the Storage Infrastructure, Managing the Storage Infrastructure **7 Hours**

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Storage Security Framework, Risk Triad, Storage Security Domains, Security Implementations in Storage Networking Monitoring the Storage Infrastructure, Storage Management Activities, Storage Infrastructure Management Challenges, Developing an Ideal Solution.

Text Books:

1. G. Somasundaram, Alok Shrivastava (Editors): Information Storage and Management: Storing, Managing & Protecting Digital Information in Classic, Visualized and Cloud Environments, 2nd edition, EMC Education Services, Wiley-India, 2009. ISBN 978-1-1180-9483-9

Reference Books:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller: Storage Networks Explained, Wiley India, 2003.
2. Rebert Spalding: Storage Networks, The Complete Reference, Tata McGraw Hill, 2003.
3. Richard Barker and Paul Massiglia: Storage Area Networks Essentials A Complete Guide to Understanding and Implementing SANs, Wiley India, 2002.

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Software Project Management

Employability

Subject Code: 13MCA556
Hours/Week: 4
Total Hours: 52

I.A. Marks : 50
Exam Hours : 3
Exam Marks: 100

UNIT I INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT **6 Hours**

Project Definition – Contract Management – Activities Covered By Software Project Management – Overview of Project Planning – Stepwise Project Planning.

UNIT II PROJECT EVALUATION **8 Hours**

Strategic Assessment – Technical Assessment – Cost Benefit Analysis –Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

UNIT III ACTIVITY PLANNING **16 Hours**

Objectives – Project Schedule – Sequencing and Scheduling Activities –Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

UNIT IV MONITORING AND CONTROL **12 Hours**

Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Prioritizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

UNIT V MANAGING PEOPLE AND ORGANIZING TEAMS **10 Hours**

Introduction – Understanding Behavior – Organizational Behavior: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team –Decision Making – Leadership – organizational Structures – Stress –Health And Safety – Case Studies.

TEXT BOOK:

1. "Software Project Management", Bob Hughes, Mikecotterell, Third Edition, Tata McGraw Hill, 2004.

REFERENCES:

1. Software Engineering Project management, Wiley Edition Second Edition edited by Richard H Thayer Foreword by Edward Yourdon
2. "Information Technology Project Management", Jack T. Marchewka, 3rd edition, Wiley India, 2009.
3. "Managing Global Projects", Ramesh, Gopalaswamy, Tata McGraw Hill, 2001.
4. "Software Project Management", Royce, Pearson Education, 1999.
5. "Software Project Management in Practice", Jalote, Pearson Education, 2002.

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Software Design Laboratory

Subject Code: 13MCA56
Hours/Week : 3
Total Hours : 42

I.A Marks : 50
Exam Hours: 03
Exam Marks: 50

The student has to draw the necessary UML diagrams using any suitable UML Drawing Tool and implement in Java OR C++ OR C# a program to demonstrate the Design Pattern specified by the Examiner. For Analysis and Design models, diagrams such as Use-case, Class Diagram, Sequence/Collaboration Diagram Should be drawn with suitable scenario, activity diagram, component diagram & deployment diagram.

The Design Pattern is allotted based on lots from the following list:

1) Expert
2) Controller
3) Publisher-Subscriber
4) Command
5) Forward-Receive
6) Client-Dispatcher
7) Proxy
8) Façade
9) Polymorphism
10) Whole-Part
11) Master-Slave

Note: Any Supporting Tool may be used.