NEW HORIZON
COLLEGE OF ENGINEERING

Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade.

Department of Computer Science and Engineering

Academic Year 2017-18

M.Tech in Computer Science and Engineering

First and Second Semesters
Scheme and Syllabus

NEW HORIZON COLLEGE OF ENGINEERING

VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence

MISSION

To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.

To encourage long-term interaction between the academia and industry through the involvement of the industry in the design of the curriculum and its hands-on implementation

To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

QUALITY POLICY

To provide services of the highest quality both curricular and co-curricular; so that our students can integrate their skills and serve the industry and society equally well at a global level.

CREDIT SCHEME FOR FIRST SEMESTER M.TECH COMPUTER SCIENCE AND ENGINEERING

S.No	Course Code	Course	BoS	Credit Distribution				Overall Credits	Marks		
				L	P	T	S		CIE	SEE	Total
1	SCS11	Advanced Operating System	CSE	4	1	0	0	5	75	75	150
2	SCS12	Artificial Intelligence	CSE	4	0	0	0	4	50	50	100
3	SCS13	Advanced Computer Networks & Security	CSE	4	0	0	0	4	50	50	100
4	SCS14x	Specialization Elective-1	CSE	4	0	0	1	5	50	50	100
5	SCS15	Human Computer Interaction	CSE	3	0	0	1	4	50	50	100
6	SCS16	Mini Project-ACN & Security	CSE					3	50	50	100
Total								25	325	325	650

Specialization Electives-1	
Course Code	**Course**
SCS141	Object Oriented Software Engineering
SCS142	Multi core Architecture and programming
SCS143	Data Warehousing and Data Mining
SCS144	Business Intelligence

***Note: Syllabus for Global Elective-1 will be made available separately.**

CREDIT SCHEME FOR SECOND SEMESTER M.TECH COMPUTER SCIENCE AND ENGINEERING

S.No	Course Code	Course	BoS	Credit Distribution				Overall Credits	Marks		
				L	P	T	S		CIE	SEE	Total
1	SCS21	Advanced Algorithms	CSE	4	1	0	0	5	75	75	150
2	SCS22	Cloud Computing	CSE	4	0	0	0	4	50	50	100
3	SCS23	Big Data Analytics	CSE	4	0	0	0	4	50	50	100
4	SCS24x	Specialization Elective-2	CSE	4	0	0	1	5	50	50	100
5	NHG25	Global Elective (TBA)	CSE	3	0	0	1	4	50	50	100
6	SCS26	Mini Project II – Cloud Computing	CSE					3	50	50	100
Total								25	325	325	650

Specialization Electives-2	
Course Code	**Course**
SCS241	Software Testing Automation
SCS242	Middleware technologies in Web and Mobile domain
SCS243	Service Oriented Architecture
SCS244	Parallel Algorithms

ADVANCED OPERATING SYSTEM

Course Code	: SCS11	Credits	: 05
L:P:T:S	: 4:1:0:0	CIE Marks	: 50+25
Exam Hours	: 03	SEE Marks	: 50+25

Course Objectives:

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

Module 1

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 .**9 Hrs**

Module 2

Threads, SMP, and Microkernel, Virtual Memory: Processes and Threads, Symmetric Multiprocessing (SMP), Microkernels, Windows Vista Thread and SMPManagement, Solaris Thread and SMP Management, Linux Process and Thread Management. Hardware and ControlStructures, Operating System Software, UNIX and Solaris Memory Management, Linux Memory Management,Windows Vista Memory Management, Summary.

9 Hrs

Module 3

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

9 Hrs

Module 4

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.
9 Hrs

Module 5

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 Manager, Creating a new Task, IPC and Synchronization, The Scheduler , Memory Manager , The Virtual AddressSpace, 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 MemoryManager, I/o Manager, The cache Manager, Kernel local procedure calls and IPC, The native API, subsystems.**8 Hrs**

ADVANCED OPERATING SYSTEM LAB

Note: The following programs can be executed on Java/C#/ any equivalent language or tool with suitable platform.

1) Design and Develop a shell that should support at least 20 commands.
2) Design and develop a program to implement lazy buddy system algorithm.
3) Write a multi-class multithreaded program that simulates multiple sleeping barbers, all in one barbershop that has a finite number of chairs in the waiting room. Each customer is instantiated from a single customer class; each barber is instantiated from a single Barber class.
4) Use ECOS operating system to develop a program for controlling accessing to a pool of resources using mutexes and condition variables.
5) Design and develop a program to realize the virus classification, such as boot sector infector, file infector and macro virus.

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

Expected Course Outcome:

At the end of the course graduate will be able to:

- Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operatingsystem
- 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.
- Demonstrate the shell.
- Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system.
- Understand the various virus detection techniques.

ARTIFICIAL INTELLIGENCE

Course Code	: SCS12	Credits	: 04
L:P:T:S	: 4:0:0:0	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

1) To familiarize students with Artificial Intelligence techniques for building well-engineered and efficient intelligent systems.
2) To develop the student's understanding of the issues involved in trying to define and simulate intelligence.
3) To familiarize the student with specific, well known Artificial Intelligence methods, algorithms and results.
4) To provide the student additional experience in the analysis and evaluation of complicated systems.
5) To provide the student with paper and proposal writing experience.

Module 1

Introduction: What is AI? Intelligent Agents: Agents and environment; Rationality; the nature of environment; the structure of agents. Problem-solving: Problem-solving agents; Example problems; Searching for solution; Uninformed search strategies Learning: Forms of

Learning; Inductive learning; Learning decision trees; Ensemble learning; Computational learning theory. **9 Hrs**

Module 2

Search strategies, Logical Agents: Informed search strategies; Heuristic functions; On-line search agents and unknown environment. Constraint satisfaction problems; Backtracking search for CSPs, Adversial search: Games; Optimal decisions in games; Alpha-Beta pruning. Knowledge-based agents; Logic; propositional logic Reasoning patterns in propositional logic; Effective Propositional inference; Agents based on propositional logic. AI: Present and Future Agent architectures **9 Hrs**

Module 3

First-Order Logic, Inference in First-Order Logic: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic; Knowledge engineering in first-order logic. propositional versus first-order inference; Unification and lifting; Forward chaining; Backward chaining; Resolution. **9 Hrs**

Module 4

Knowledge Representation and Planning: Ontological engineering; Categories and objects; Actions, situations and events; Mental events and mental objects; The Internet shopping world; Reasoning systems for categories, Reasoning with default information; Truth maintenance systems. The planning problem; Planning with state-space approach; Planning graphs; Planning with prepositional logic.
9 Hrs

Module 5

Uncertainty, Probabilistic Reasoning: Uncertainty: Acting under certainty ;Inference using full joint distributions; Independence; Bayes ' rule and its use; Probabilistic Reasoning:

Representing knowledge in an uncertain domain; The semantics of Bayesian networks; Efficient representation of conditional distributions; Exact inference in Bayesian networks;

Approximate inference in Bayesian Networks; Extending probability to first-order representations; Other approaches to Uncertain Reasoning.
8Hrs

Text Book:

1) Stuart Russel, Peter Norvig: Artificial Intelligence a Modern Approach, 2nd Edition, Pearson Education, 2003.

Reference Books:

1) Elaine Rich, Kevin Knight: Artificial Intelligence, 2nd Edition, and Tat McGraw Hill, 1991.
2) Nils J.Nilsson: Principles of Artificial Intelligence, Elsevier, 1986

Expected Course Outcome:

At the end of the course graduate will be able to:

- understand the history, development and various applications of artificial intelligence
- familiarize with propositional and predicate logic and their roles in logic programming
- understand the programming language Prolog and write programs in declarative programming style
- learn the knowledge representation and reasoning techniques in rule-based systems, case-based systems, and model-based systems
- appreciate how uncertainty is being tackled in the knowledge representation and reasoning process, in particular, techniques based on probability theory and possibility theory (fuzzy logic)
- master the skills and techniques in machine learning, such as decision tree induction, artificial neural networks, and genetic algorithm
- apply and integrate various artificial intelligence techniques in intelligent system development as well as understand the importance of maintaining intelligent systems

ADVANCED COMPUTER NETWORKS& SECURITY

Course Code	: SCS13	Credits	: 04
L:P:T:S	: 4:0:0:0	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

1) To become familiar with the basics of Computer Networks and learn Network architectures.
2) To learn Concepts of fundamental protocols.
3) To gain the knowledge of internetworking concepts.
4) To understand the knowledge of internetworking concepts in various applications.
5) To acquire knowledge of implementation concepts in congestion control and error detections.
6) To get an overview of security and firewalls.

Module 1

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. **9 Hrs**

Module 2

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. **9 Hrs**

Module 3

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 **9 Hrs**

Module 4

End-to-End Protocols: Simple De-multiplexer (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.

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). **9 Hrs**

Module 5

An Overview of Computer Security-Security Services-Security Mechanisms-Security Attacks-Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies. Network security Practice: Authentication applications; Kerberos, X.509 Directory Authentication Service, Electronic Mail Security; PGP, S/MIME, IP Security; Web Security, SSL and TLS, SET. System Security: Intruders, Viruses, worms and Related Threats. Firewalls; Firewall Design Principles, Trusted Systems. **8 Hrs**

Text Books:

1) Larry Peterson and Bruce S Davis "Computer Networks :A System Approach" 5th Edition , Elsevier -2014

2) Douglas E Comer, "Internetworking with TCP/IP, Principles, Protocols and Architecture" 6th Edition, PHI – 2014

3) Charlie Kaufman, Radia Perlman, Mike Speciner, "Network Security: Private Communication in a PublicWorld", Prentice-Hall, 2002.

4) Wong, Angus, Yeung, Alan "Network Infrastructure Security", Springer, 2009

Reference Books:

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

3) William Stallings, “Cryptography and Network Security: Principles and Practices”, Third Edition, Pearson Education, 2006.
4) Matt Bishop ,“Computer Security art and science ”, Second Edition, Pearson Education, 2002
5) Wade Trappe and Lawrence C. Washington, “Introduction to Cryptography with Coding Theory” Second Edition, Pearson Education, 2007 Jonathan Katz, and Yehuda Lindell, Introduction to Modern Cryptography, CRC Press, 2007 39
6) Douglas R. Stinson, “Cryptography Theory and Practice”, Third Edition, Chapman & Hall/CRC, 2006
7) Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, First Edition, 2006.
8) Network Security and Cryptography, Menezes Bernard, Cengage Learning, New Delhi, 2011
9) Man Young Rhee, Internet Security, Wiley, 2003

Expected Course Outcome:

At the end of the course graduate will 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.

OBJECT ORIENTED SOFTWARE ENGINEERING

Course Code	: SCS141	Credits	: 05
L:P:T:S	: 4:0:0:1	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

1) To learn about software prototyping, analysis and design
2) To learn UML and its usage
3) To estimate and scheduling of objects
4) To implement and test an object.

Module 1

INTRODUCTION: Software Engineering Paradigms - Software Development process models - Project & Process - Project management – Process & Project metrics – Object Oriented concepts & Principles. **9 Hrs**

Module 2

PLANNING & SCHEDULING: Software prototyping - Software project planning – Scope – Resources – Software Estimation - Empirical Estimation Models-Planning-Risk Management – Software Project Scheduling – Object Oriented Estimation & Scheduling. **9 Hrs**

Module 3

ANALYSIS & DESIGN: Analysis Modeling - Data Modeling - Functional Modeling & Information Flow Behavioral Modeling-Structured Analysis - Object Oriented Analysis – Domain Analysis-Object Oriented Analysis process - Object Relationship Model – Object Behavior Model. Design Concepts & Principles - Design Process – Design Concepts - Modular Design – Design Effective Modularity - Introduction toSoftware Architecture - Data Design – Transform Mapping – Transaction Mapping – OOD - Design System design process- Object design process – Design Patterns. **9 Hrs**

Module 4

IMPLEMENTATION & TESTING: Top-Down, Bottom-Up, object oriented product Implementation & Integration. Software Testing methods-White Box, Basis Path-Control Structure –Black Box- Unit Testing- Integration testing Validation & System testing. Testing OOA & OOD models-Object oriented testing strategies. **9 Hrs**

Module 5

MAINTENANCE: Maintenance process-System documentation-program evolution dynamics-Maintenance costs Maintainability measurement – Case Studies **8Hrs**

Text Books:

1) Roger S. Pressman, "Software Engineering A Practitioner's Approach", Sixth Edition, Tata McGraw Hill 2010.
2) Grady Booch, Robert A.Maksimchuk Michael W. Engle, Bobby J.Young Jim Connallen Kelli A. Houston, "Object oriented analysis and design with application", Addison Wesley, 3rd edition, 2010.
3) PankajJalote "An Integrated Approach to Software Engineering" Narosa Publishing House 2005.
4) Carlo Ghezzi Mehdi Jazayer, Dino Mandrioli, "Fundamentals of Software Engineering", Prentice Hall of India 2002.

Reference Books:

1) Ivar Jacobson, "Object Oriented Software Engineering: A Use Case Driven Approach" 1st Edition
2) **Bertrand Meyer, "Object Oriented Software Construction", Prentice Hall International Series.**

Expected Course Outcome:

At the end of the course graduate will be able to:

- Understand the principles of large scale software systems, and the processes that are used to build them;
- Have skills in the most widely used approach to software construction – object orientation (OO), including OO requirement specifications, OO analysis, OO design, OO Programming, OO testing and maintenance;
- Use tools and techniques for producing application software solutions from informal and semi-formal problem specifications;
- Acquire and develop many valuable skills such as the ability to use computer aided software Engineering tools to analyze, evaluate, select and synthesize information sources for the purpose of developing a software system;
- Develop an appreciation of the cost, quality, and management issues involved in software construction;

MULTICORE ARCHITECTURE & PROGRAMMING

Course Code	: SCS142	Credits	: 05
L:P:T:S	: 4:0:0:1	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

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

Module 1

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. **9 Hrs**

Module 2

Fundamental Concepts of Parallel Programming: Designing for Threads, Task Decomposition, DataDecomposition, Data Flow Decomposition, Implications of Different Decompositions, Challenges You'llFace, Parallel Programming Patterns, A Motivating Problem: Error Diffusion, Analysis of the ErrorDiffusion Algorithm, An Alternate Approach: Parallel Error Diffusion, Other Alternatives. **9 Hrs**

Module 3

Threading and Parallel Programming Constructs: Synchronization, Critical Sections, Deadlock,

Synchronization Primitives, Semaphores, Locks, Condition Variables, Messages, Flow Control- basedConcepts, Fence, Barrier, Implementation-dependent Threading Features.

Threading APIs : ThreadingAPIs for Microsoft Windows, Win32/MFC Thread APIs, Threading APIs for Microsoft. NET Framework,Creating Threads, Managing Threads, Thread Pools, Thread Synchronization, POSIX Threads, CreatingThreads, Managing Threads, Thread Synchronization, Signaling, Compilation and Linking **9 Hrs**

Module 4

OpenMP: A Portable Solution for Threading: Challenges in Threading a Loop, Loop-carriedDependence, Data-race Conditions, Managing Shared and Private Data, Loop Scheduling and Portioning,Effective Use of Reductions, Minimizing Threading Overhead, Work-sharing Sections, PerformanceorientedProgramming, 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 toOpenMP, OpenMP Library Functions, OpenMP Environment Variables, Compilation, Debugging,performance. **9 Hrs**

Module 5

Solutions to Common Parallel Programming Problems: Too Many Threads, Data Races, Deadlocks, andLive Locks, Deadlock, Heavily Contended Locks, Priority Inversion, Solutions for Heavily ContendedLocks, Non-blocking Algorithms, ABA Problem, Cache Line Ping-ponging, Memory Reclamation Problem,Recommendations, Thread-safe Functions and Libraries, Memory Issues, Bandwidth, Working in theCache, Memory Contention, Cache-related Issues, False Sharing, Memory Consistency, Current IA-32Architecture, Itanium Architecture, High-level Languages, Avoiding Pipeline Stalls on IA-32,DataOrganization for High Performance.**8Hrs**

Text Book:

1) Multicore Programming, Increased Performance through Software Multi-threading by ShameemAkhterand Jason Roberts , Intel Press , 2006.

Reference Book:

1) Stephen W. Keckler, KunleOlukotun, H. Peter Hofstee, "Multicore Processors and Systems **",** Springer Science & Business Media

Expected Course Outcome:

At the end of the course graduate 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.

DATA WAREHOUSING & DATA MINING

Course Code	: SCS143	Credits	: 05
L:P:T:S	: 4:0:0:1	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

1) To expose the students to the concepts of Data warehousing Architecture and Implementation
2) To Understand Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
3) To learn to use association rule mining for handling large data
4) To understand the concept of classification for the retrieval purposes
5) To know the clustering techniques in details for better organization and retrieval of data.

Module 1

Introduction and Data Pre-processing: Why data mining, What is data mining, What kinds of data can be mined, What kinds of patterns can be mined, Which Technologies Are used, Which kinds of Applications are targeted, Major issues in data mining. Data Pre-processing: An overview, Data cleaning, Data integration, Data reduction, Data transformation and data discretization. **9 Hrs**

Module 2

Data warehousing and online analytical processing: Data warehousing: Basic concepts, Data warehouse modelling: Data cube and OLAP, Data warehouse design and usage, Data warehouse implementation, Data generalization by attribute-oriented induction
9 Hrs

Module 3

Classification: Basic Concepts: Basic Concepts, Decision tree induction, Bays Classification Methods, Rule-Based classification, Model evaluation and selection, Techniques to improve classification accuracy **9 Hrs**

Module 4

Cluster Analysis: Basic concepts and methods: Cluster Analysis, Partitioning methods, Hierarchical Methods,Density-based methods, Grid-Based Methods, Evaluation of clustering. **9 Hrs**

Module 5

Data mining trends and research frontiers: Mining complex data types, other methodologies of data mining,Data mining applications, Data Mining and society. **8Hrs**

Text Book:

1) Jiawei Han, MichelineKamber, Jian Pei: Data Mining Concepts and Techniques, ELSEVIER(MK) 3rd edition 2012.

Reference Books:

1) Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw –Hill Edition, Tenth Reprint 2007.
2) K.P. Soman, ShyamDiwakar and V. Ajay "Insight into Data mining Theory and Practice", EasterEconomy Edition, Prentice Hall of India, 2006.
3) G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, PrenticeHall of India, 2006.
4) Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", PearsonEducation, 2007.

Expected Course Outcome:

At the end of the course graduate will be able to:

- Store voluminous data for online processing
- Pre-process the data for mining applications
- Apply the association rules for mining the data
- Design and deploy appropriate classification techniques
- Cluster the high dimensional data for better organization of the data

PATTERN RECOGNITION & IMAGE PROCESSING

Course Code	: SCS144	Credits	: 05
L:P:T:S	: 4:0:0:1	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

1) To study the mathematical morphology necessary for Pattern recognition.
2) To introduce the student to various Pattern recognition techniques.
3) To study the Representation and description and feature extraction.
4) To study the Mathematical Preliminaries in image processing.
5) To understand the Image Restoration Technique.
6) To understand the image fundamentals and mathematical transforms necessary for image processing and to study the image enhancement techniques.
7) To understand the image segmentation and representation techniques.

Module 1

Pattern Recognition: The nature of statistical pattern recognition; three learning paradigms; the sub-problems of pattern recognition; the basic structure of a pattern recognition system; Comparing classifiers.

Bayes Decision Theory : General framework; optimal decisions; Classification; Simple performance bounds **9 Hrs**

Module 2

Learning –Parametric Approaches: Basic statistical issues; Sources of classification error; Bias and variance; three approaches to classification: density estimation, regression and discriminant analysis; Empirical error criteria; Optimization methods; Failure of MLE, Linear and quadratic discriminants, Perceptrons.

Feature Extraction: Optimal features; Optimal linear transformations; Linear and nonlinear principal components; Feature subset selection; Feature Extraction and classification stages, Unsupervised learning and clustering, Syntactic pattern recognition, Fuzzy set Theoretic approach to PR. **9 Hrs**

Module 3

Image Processing: Digital Image Representation, Fundamental steps in Image Processing, Elements of Digital Image Processing - Image Acquisition, Storage, Processing, Communication, Display. Digital Image Formation A Simple Image Model, Geometric Model-Basic Transformation (Translation, Scaling, Rotation), Perspective Projection, Sampling & Quantization - Uniform & Non uniform.

Mathematical Preliminaries: Neighbour of pixels, Connectivity, Relations, Equivalence & Transitive Closure; Distance Measures, Arithmetic/Logic Operations, Fourier Transformation, Discrete Cosine & Sine Transform. **9 Hrs**

Module 4

Image Enhancement: Spatial Domain Method, Frequency Domain Method, Contrast Enhancement -Linear & Nonlinear Stretching, Histogram Processing; Smoothing - Image Averaging, Mean Filter, Low-pass Filtering; Image Sharpening. High-pass Filtering, High-boost Filtering, Derivative Filtering, Homomorphic Filtering

Image Restoration: Degradation Model, Discrete Formulation, Algebraic Approach to Restoration - Unconstrained & Constrained; Constrained Least Square Restoration, Restoration by Homomorphic Filtering, Geometric Transformation - Spatial Transformation, Gray Level Interpolation. **9 Hrs**

Module 5

Image Segmentation: Point Detection, Line Detection, Edge detection, Combined detection, Edge Linking & Boundary Detection - Local Processing, Global Processing via The Hough Transform; Threshold - Foundation, Simple Global Threshold, Optimal Threshold; Region Oriented Segmentation - Basic Formulation, Region Growing by Pixel Aggregation, Region Splitting & Merging. **8Hrs**

Text Books:

1. Digital Image Processing, Tao Gonzalez, Woods, Pearson
2. Rafael C Gonzalez and Richard E. Woods: Digital Image Processing, PHI 2nd Edition 2005
3. Pattern Recognition (An Introduction) , V Susheela Devi, M Narsimha Murthy, Universities Press, ISBN 978-81-7371- 725-3,2011.
4. Pattern Recognition & Image Analysis, Earl Gose, Richard Johnsonbaugh, Steve Jost. PHI ISBN-81-203-1484-0, 1996.

Reference Books:

1. Digital Image Processing, Jahne, Springer India
2. Fundamentals of Digital Image Processing, Jain, PHI
3. Image Processing, Analysis & Machine Vision, Sonka, VIKAS
4. K. Jain: Fundamentals of Digital Image Processing, Pearson, 2004.
5. Scott.E.Umbaugh: Digital Image Processing and Analysis, CRC Press, 2014.

6. S.Jayaraman, S.Esakkirajan, T.Veerakumar: Digital Image Processing, McGraw Hill Ed. (India) Pvt. Ltd., 2013.
7. Duda R. O., P.E. Hart, D.G. Stork., Pattern Classification, John Wiley and sons, 2000

Expected Course Outcome:

At the end of the course graduate will be able to:

- Develop and analyze decision tress.
- Design the nearest neighbor classifier.
- Develop algorithms for Pattern Recognition.
- Understand image formation and the role human visual system plays in perception of 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.
- Apply algorithms in practical applications.

HUMAN COMPUTER INTERACTION

Course Code	: SCS15	Credits	: 05
L:P:T:S	: 3:0:0:1	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

6) Determine the need for computers and evaluate the use of computers
7) identify the stages in software engineering that need to be modified for effectiveness of interacting with computers
8) discover the various models that can be used for designing systems
9) evaluate the design techniques by applying the apt statistical approach
10) design dialogue for representation to computers

Module 1

DESIGN PROCESS: Humans – Information process – Computer – Information Process – Differences and Similaritiesbetween them – Need for Interaction – Models – Ergonomics – Style – Context – Paradigms– Designing of Interactive systems – Usability – Paradigm shift – Interaction design basics –Design Process – Scenarios – Users need – Complexity of design**9 Hrs**

Module 2

DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS: Software Process – Usability engineering – Issue based Information systems – Iterativedesign practices – Design rules – maximum usability – Principles – Standards and guidelines– design patterns – Programming Tools – Windowing systems – Interaction tool kit – UserInterface management system – Evaluation techniques – evaluation design – Evaluatingimplementations – Observational Methods**9 Hrs**

Module 3

MODELS: Universal design principles – Multimodal systems – User Support – Presentation andImplementation Issues – types – requirements – approaches – Cognitive model – Hierarchicalmodel – Linguistic model – physical and device models – Socio-technical models –Communication and Collaboration models – Task models – Task analysis and design**9 Hrs**

Module 4

EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI: Basic Design structure – Single independent variable – multiple independent variable –factorial design – split-plot design – random errors – experimental procedure – Statisticalanalysis – T tests – Analysis of Variance test – Regression – Chi-Square test – Survey –Probabilistic sampling – Non-probabilistic sampling – developing survey questions**9 Hrs**

Module 5

THEORIES: Dialogue notations and design – Dialogue need – dialogue design notations – Graphical –Textual - representing dialogue – formal descriptions – Dialogue analysis – System models– Interaction models – relationship with dialogue – Formalisms – Formal notations – Interstitialbehavior – Virtual reality – Modeling rich interaction – Status Event analysis – Properties –Rich contexts – Sensor-based systems – Groupware – Applications – Ubiquitous computing– Virtual reality**8 Hrs**

Text Books:

3) Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
4) Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in Human-Computer Interaction, Wiley, 2010.

Reference Books:

2) Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

Expected Course Outcome:

At the end of the course graduate will be able to:

- explain why it is important to design interactive products that are usable
- define key terms used in interaction design
- explain key theories used in the design of interactive products
- explain the importance of iteration, evaluation and prototyping in interaction design

MINI PROJECT I – Advanced Computer Networks and Security

Course Code	: SCS16	Credits	: 03
L:P:T:S	: 0:3:0:0	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Students are expected to independently identify a problem related to the field of Advanced Computer Networks and Security, and carry out a mini project on the problem defined. Projects should be coded (or programmed) individually and independently. The code developed towards the project will be reviewed by a panel of examiners at multiples levels. Plagiarized projects will automatically get an **"F" GRADE** and the student will be liable for further disciplinary action. At the completion of a project, the student is to submit a project report and make a presentation, which will be evaluated (end semester assessment) by duly appointed examiner(s).

ADVANCED ALGORITHMS

Course Code	: SCS21	Credits	: 05
L:P:T:S	: 4:1:0:0	CIE Marks	: 50+25
Exam Hours	: 03	SEE Marks	: 50+25

Course Objectives:

1) To introduce and practice advanced algorithms and programming techniques necessaryfor developing sophisticated computer application programs
2) To get accustomed with various graph algorithms and polynomials.
3) Understand and implement various string matching algorithms.
4) Develop the skills to design and implement efficient programming solutions to various problems

Module 1

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. **9 Hrs**

Module 2

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. **9 Hrs**

Module 3

Number -Theoretic Algorithms: Elementary notions; GCD; Modular Arithmetic; Solving modularlinear equations; The Chinese remainder theorem; Powers of an element; RSA cryptosystem; Primality testing; Integer factorization. **9 Hrs**

Module 4

String-Matching Algorithms: Naïve string Matching; Rabin - Karp algorithm; String matching with

finite automata; Knuth-Morris-Pratt algorithm; Boyer – Moore algorithms. **9 Hrs**

Module 5

Probabilistic and Randomized Algorithms: Probabilistic algorithms; Randomizing deterministic

algorithms, Monte Carlo and Las Vegas algorithms; Probabilistic numeric algorithms **8 Hrs**

ADVANCED ALGORITHMS LAB

Note: The following programs can be executed on Java/C#/any equivalent tool/language 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 primalityof 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 algorithm and determine its performance.

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, SartajSahni, S.Rajasekharan: Fundamentals of Computer Algorithms, 2nd Edition, Universities press, 2007.

Expected Course Outcome:

At the end of the course graduate 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.
- Design and apply graph search algorithms.
- Design and implement string matching algorithms.
- Design modular linear equation algorithms.

CLOUD COMPUTING

Course Code	: SCS22	Credits	: 04
L:P:T:S	: 4:0:0:0	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

1) To learn how to use Cloud Services.
2) To implement Virtualization
3) To implement Task Scheduling algorithms.
4) Apply Map-Reduce concept to applications.
5) To build Private Cloud.

Module 1

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. **9 Hrs**

Module 2

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. **9 Hrs**

Module 3

Cloud Resource Virtualization: Virtualization, Layering and virtualization, Virtual machine monitors, Virtual Machines, Performance and Security Isolation, Full virtualization and para virtualization, Hardware support for virtualization, Case Study: Xen a VMM based para virtualization, Optimization of network virtualization, vBlades, Performance comparison of virtual machines, The dark side of virtualization, Exercises and problems.**9 Hrs**

Module 4

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. **9 Hrs**

Module 5

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. **8Hrs**

Text Book:

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

Reference Books:

1) RajkumarBuyya,James Broberg, AndrzejGoscinski: Cloud Computing Principles and Paradigms, Willey 2014.
2) John W Rittinghouse, James F Ransome: Cloud Computing Implementation, Management and Security, CRC Press 2013.

Expected Course Outcome:

At the end of the course graduate will 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.

BIG DATA ANALYTICS

Course Code	: SCS23	Credits	: 04
L:P:T:S	: 4:0:0:0	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

1) To explore the fundamental concepts of big data analytics
2) To learn to analyse the big data using intelligent techniques.
3) To understand the various search methods and visualization techniques.
4) To learn to use various techniques for mining data stream.
5) To understand the applications using Map Reduce Concepts.

Module 1

INTRODUCTION TO BIG DATA: Introduction to BigData Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools - Statistical Concepts: Sampling Distributions - ReSampling, Statistical Inference - Prediction Error **9 Hrs**

Module 2

MINING DATA STREAMS: Introduction To Streams Concepts – Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating Moments – Counting Oneness in a Window – Decaying Window - Real time Analytics , Platform(RTAP) Applications - Case Studies - Real Time Sentiment Analysis, Stock Market Predictions. **9 Hrs**

Module 3

HADOOP: History of Hadoop - The Hadoop Distributed File System – Components of Hadoop - Analyzing the Data with Hadoop - Scaling Out - Hadoop Streaming - Design of HDFS - Java interfaces to HDFS Basics - Developing a Map Reduce Application - How Map Reduce Works - Anatomy of a Map Reduce Job run – Failures - Job Scheduling - Shuffle and Sort Task execution - Map Reduce Types and Formats - Map Reduce Feature **9 Hrs**

Module 4

HADOOP ENVIRONMENT: Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration - Security in Hadoop - Administering Hadoop – HDFS - Monitoring – Maintenance – Hadoop benchmarks - Hadoop in the cloud **9 Hrs**

Module 5

FRAMEWORKS: Applications on Big Data Using Pig and Hive – Data processing operators in Pig – Hive services – HiveQL – Querying Data in Hive - fundamentals of HBase and ZooKeeper - IBM InfoSphereBigInsights and Streams. Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications **8 Hrs**

Text Books:

1) Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2) Tom White "Hadoop: The Definitive Guide" Third Edition, O'reilly Media, 2012.
3) Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012
4) AnandRajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
5) Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", JohnWiley & sons, 2012.
6) Michael Minelli (Author), Michele Chambers (Author), AmbigaDhiraj (Author) , Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications,2013
7) Zikopoulos, Paul, Chris Eaton, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, Tata McGraw Hill Publications, 2011

Reference Books:

1) Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007
2) PeteWarden, "Big Data Glossary", O'Reilly, 2011.
3) Jiawei Han, MichelineKamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
4) Da Ruan, Guoquing Chen, Etienne E.Kerre, GeertWets, Intelligent Data Mining, Springer, 2007
5) Paul Zikopoulos, Dirk deRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corrigan , Harness the Power of Big Data The IBM Big Data Platform, Tata McGraw Hill Publications, 2012

Expected Course Outcome:

At the end of the course graduate will be able to:

- Work with big data platform
- Analyze the big data analytic techniques for useful business applications.
- Design efficient algorithms for mining the data from large volumes.
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics

SOFTWARE TESTING AUTOMATION

Course Code	**: SCS241**	**Credits**	**: 04**
L:P:T:S	**: 4:0:0:1**	**CIE Marks**	**: 50**
Exam Hours	**: 03**	**SEE Marks**	**: 50**

Course Objectives:

- Gaining confidence about the level of quality.
- Providing information for decision making.
- Understand the essential characteristics of Tools used for Automation test.
- Prevention of defects.
- Describe principles of system and component tesing.

MODULE 1

The software quality challenge, what is software quality, software quality factors, the components of the software quality assurance system – overview : an SQA architecture , Pre-project components, Software project life cycle components, Infrastructure components for error prevention and improvement, Management SQA components, SQA standards, system certification, and assessment components, Organizing for SQA – the human components, Considerations guiding construction of an organization's SQA system

9 Hrs

MODULE 2

Contract review: The contract review process and its stages, Contract review objectives, Implementation of a contract review, Contract review subjects, Contract reviews for internal projects, Development and quality plans, Reviews, objectives, formal design reviews, peer reviews, a comparison of team review methods, expert opinions **9 Hrs**

MODULE 3

Basics of software testing: humans, errors and testing, Requirements, behavior and Correctness. Correctness versus reliability, testing and debugging, test metrics, testing and

Verification, static testing, types of testing **9 Hrs**

MODULE 4

Test generation from requirements: introduction, the test selection problem, equivalence partitioning, boundary value analysis and category partition method, **Test generation from finite state models:** SW design and testing, finite state model, conformance testing, fault model, characterization test, W method and WP method. **9 Hrs**

MODULE 5

Test generation from combinatorial designs: combinatorial designs, a combinatorial test Design process, fault model, Regression testing: what is RT? , RT process, RTS the problem, selecting RT, test selection using execution trace, TS using dynamic slice,
Scalability of TS algorithms, test minimization, test prioritization, tools for RT **8 Hrs**

Text Book:

1. Explore It quality Assurance, Elisabeth Hendrickson-2015
2. Software quality assurance-from theory to implementation, Daniel Galin, Pearson, 2009.(U1)
3. Lesson learned in Software Testing, cem kaner, james beach-2015

Reference books:

1. Software Quality, Mordechei Ben – Menachem, Garry S. Marlis , Thomson
2. Software Testing- Principles and practices, Srinivasan D , Gopalaswamy Ramesh , Pearson, 2006
3. Software Quality Theory and Management, 2nd Edition, Alan C Gillies , Cenagage Learning, 2003

Expected Course Outcome:

Students shall:

- Realize how to apply theory in practical ways to design test based on test criteria.
- Demonstrate various test process and continuous quality improvement.
- Reveals the uses of various test Tools.
- Identifies the types of errors and fault models.

Assessment Method:

CIE:

1. Three internals tests of 30 marks each will be conducted and the average of the top two test marks will be considered.
2. Assignment - 10 marks
3. Quiz test / Seminar - 10 marks

SEE:

1. SEE will be conducted for 100 marks and shall be for a duration of 3 hours
2. Two Questions will be set from each module carrying 20 Marks each.
3. Students have to answer 5 questions selecting one full question from each module.

MIDDLEWARE TECHNOLOGIES IN WEB AND MOBILE DOMAIN

Course Code	: SCS242	Credits	: 05
L:P:T:S	: 4:0:0:1	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

1) To provide the foundation knowledge of middleware middleware.
2) To provide overview of using CORBA as middleware
3) Understand the Requirement of middleware and its connectivity.

Module 1

CORBA with Java: Review of Java concept like RMI, RMI API, and JDBC. Client/Server CORBAstyle, Theobject web: CORBA with Java.

Core CORBA / Java: Two types of Client/ Server invocations-static, dynamic. The static CORBA, first CORBAprogram, ORBlets with Applets, Dynamic CORBA-The portable count, the dynamic count multi count. **9 Hrs**

Module 2

Java Bean Component Model: Events, properties, persistency, Intrespection of beans, CORBABeans EJBs and CORBA: Object transaction monitors CORBA OTM's, EJB and CORBA OTM's, EJB containerframe work, Session and Entity Beans, The EJB client/server development Process. **9 Hrs**

Module 3

Fundamentals & Emerging Technologies: Infrastructure Vs ad Hoc Wireless network: Mobility issues and solutions, Evolution of application models forpervasive computing and mobile middleware motivation. Name resolution and service discovery on theinternet and in ad Hoc network, data Synchronization, Content based published subscribe in a mobileenvironment, proxy based adaptation for mobile computing, reflective middleware, Techniques for Dynamicadaptation of mobile services . **9 Hrs**

Module 4

Requirements for mobile middleware and connectivity: Naming and discovery in mobile system, efficient data caching and consistency maintenance in wirelessmobile system Seamless connectivity in infrastructure based network. Peer to Peer computing in mobile AdHoc network, impact of mobility on resource management in wireless network, seamless service access viaresource replication. **9 Hrs**

Module 5

Mobile middleware for location dependent service: An overview of the location management problems for mobile computing environment, location privacyprotection in mobile wireless network ,location based service differentiation, location dependent databaseaccess, location dependent service accounting middleware for wearable computing as an application domainfor service based on mobile middleware. **8 Hrs**

Text Books:

1) Client/Server programming with Java and CORBA Robert Orfali and Dan Harkey,John Wiley & Sons ,SPD 2nd Edition.
2) Java programming with CORBA 3rd Edition, G.Brose, A Vogel and K.Duddy,Wiley-dreamtech, India John wiley and sons.
3) Handbook of mobile Middleware (Auerbach Publication) by Paulo Bellavista,AntonioCorradi,

Reference Books:

1) Distributed Computing, Principles and applications, M.L.Liu, Pearson Education
2) Client/Server Survival Guide 3rd edition Robert Orfali Dan Harkey and Jeri Edwards, JohnWiley & Sons
3) Client/Server Computing D T Dewire, TMH.
4) IBM Webspere Starter Kit Ron Ben NatanOriSasson, TMh, New Delhi

Expected Course Outcome:

At the end of the course graduate will be able to:

- Implement applications using JDBC and RMI.
- Implement Distributed Java programming using CORBA
- Implement EJB component and
- Apply knowledge and techniques for dynamic adaptation in Mobile services.
- Apply problem solving approaches towards seamless connectivity and location management

SERVICE ORIENTED ARCHITECTURE

Course Code	: SCS243	Credits	: 05
L:P:T:S	: 4:0:0:1	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

6) To understand various architecture for application development
7) To understand the importance of SOA in Application Integration
8) To learn web service and SOA related tools
9) To Learn implementation details of SOA
10) To understand various case studies

Module 1

SOA BASICS:Software Architecture – Types of IT Architecture – SOA – Evolution – Key components

perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecturefor enterprise application – Software platforms for enterprise Applications – Patterns for SOA – SOAprogramming models. **9 Hrs**

Module 2

SOA ANALYSIS AND DESIGN: Service-oriented Analysis and Design – Design of Activity, Data, Clientand 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 ofSPA – Cost Savings. **9 Hrs**

Module 3

SOA GOVERNANCE:SOA implementation and Governance – strategy – SOA development – SOAgovernance – trends in SOA – event-driven architecture – software s a service – SOA technologies – proof-ofconcept– process orchestration – SOA best practices. **9 Hrs**

Module 4

SOA IMPLEMENTATION:SOA based integration – integrating existing application – development of webservices – Integration - SOA using REST – RESTful services – RESTful services with and without JWS – Roleof WSDL,SOAP and Java/XML mapping in SOA – JAXB Data binding. **9 Hrs**

Module 5

APPLICATION INTEGRATION:JAX –WS 2.0 client side/server side development – Packaging andDeployment of SOA component – SOA shopper case study –WSDL centric java WS with SOA-J –relatedsoftware – integration through service composition (BPEL) – case study - current trends. **8 Hrs**

Text Book:

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

Reference Books:

3) Mark D. Hansen, "SOA using Java Web Services", Practice Hall, 2007.
4) WaseemRoshen, "SOA-Based Enterprise Integration", Tata McGraw-HILL, 2009.

Expected Course Outcome:

At the end of the course graduate will be able to:

- Comparison of 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

PARALLEL ALGORITHMS

Course Code	: SCS244	Credits	: 05
L:P:T:S	: 4:0:0:1	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Course Objectives:

1) To learn parallel algorithms development techniques for shared memory and DCM models.
2) To study the main classes of fundamental parallel algorithms.
3) To study the complexity and correctness models for parallel algorithms

Module 1

Introduction: Introduction to Parallel Algorithms – Models of computation – Selection – Mergin on EREW and CREW – Median of two sorted sequence – Fast Merging on EREW – Analyzing Parallel Algorithms. **9 Hrs**

Module 2

SORTING & SEARCHING: Sorting Networks – Sorting on a Linear Array Sorting on CRCW, CREW, EREW – Searching a sorted sequence –Searching a random sequence – Bitonic Sort.
9 Hrs

Module 3

ALGEBRAIC PROBLEMS: Permutations and Combinations – Matrix Transpositions – Matrix by Matrix multiplications – Matrix by vector multiplication.**9 Hrs**

Module 4

GRAPH & GEOMETRY: Connectivity Matrix – Connected Components –All Pair Shortest Paths – Minimum Spanning Trees – Point Inclusion –Intersection, Proximity and Construction Problems.

9 Hrs

Module 5

OPTIMIZATION & BIT COMPUTATIONS: Prefix Sums – Job Sequencing Knapsack - Adding two integers – Adding n integers – Multiplying two integers – Selection**8 Hrs**

Text Books:

1) Selim G. Akl, The Design and Analysis of Parallel Algorithms, Prentice Hall, New Jercy, 1989.
2) Michael J. Quinn, Parallel Computing: Theory & Practice, Tata McGraw Hill Edition, 2003.
3) Joseph JaJa, Introduction to Parallel Algorithms, Addison-Wesley, 1992

Reference Books:

1) Introduction to Parallel Computing: AnanthGrama, Anshul Gupta, George Karypis, Vipin Kumar, Addison Wesley, Second edition.

2) Dependence Concept by Utpal Banerjee (Intel Corporation) Kluwer Academic Publishers

Expected Course Outcome:

At the end of the course graduate will be able to:

- Familiar with design of parallel algorithms in various models of parallel computation
- Familiar with the efficient parallel algorithms related to many areas of computer science: expression computation, sorting, graph - theoretic problems, computational geometry, etc.
- Familiar with the basic issues of implementing parallel algorithms

MANAGEMENT INFORMATION SYSTEMS

Course Code : SCS25	**Credits : 04**
L:P:T:S : 4:0:0:1	**CIE Marks : 50**
Exam Hours : 03	**SEE Marks : 50**

Course Objectives:

1) It is expected that students are able to understand the usage of Information Systems in management.
2) The students also would understand the activities that are undertaken in acquiring an Information System in an organization.
3) Further the student would be aware of various Information System solutions like ERP, CRM, Data warehouses and the issues in successful implementation of these technology solutions in any organization

Module 1

Information System in the Enterprise – Digital Convergence and the changing business environment – Perspectives on information systems – Business perspective on information systems
– Dimensions of information systems - Contemporary Approaches to Information Systems – Learning to Use Information Systems – New Opportunities with Technology – Major types of Systems in Organizations – ESS – DSS – MIS – TPS – Systems from a functional perspective – Introduction to BPO & KPO – Case studies. **9 Hrs**

Module 2

Information Technology Infrastructure – Levels of IT infrastructure – Evolution of IT infrastructure
– Technology drivers of infrastructure evolution – Managing data resources – Organizing data in a traditional file environment – The data base approach to data management – Types of data bases – Hierarchical and network DBMS – Object oriented data bases – Designing data bases – Distributing Data bases – Database trends – Data warehouses and Data mining – The web and the hyper media databases – Linking internal databases to the web – Cost benefit consideration – Data administration – Case Studies **9 Hrs**

Module 3

The knowledge management landscape – Important dimensions of knowledge – Knowledge Management value chain – Types of knowledge Management Systems – Enterprise wide Management Systems – Structured and Semi structured knowledge Systems – Knowledge network Systems – Knowledge work Systems – Intelligent techniques – Expert Systems – Case based reasoning – Fuzzy logic Systems – Neural networks - Genetic Algorithms – Hybrid AI Systems – Intelligent agents **9 Hrs**

Module 4

Decision making & Decision support Systems – Systems for decision support – Group decision support Systems – Executive support in the enterprise – Management Opportunities challenges &
Solutions – Case studies.-Systems as planned organizational change – Business process reengineering & process improvement – Overview of Systems Development – System analysis – Systems design - Alternative System Building Approaches – Traditional Systems life cycle – Proto typing – End user development **9 Hrs**

Module 5

Information Systems security & Control – Systems vulnerability & Abuse – Internet vulnerabilities – Wireless security challenges – Malicious software – Hackers and Cyber vandalism – Computer crime and Cyber terrorism – Business value of security & control – Technologies & tools for security and control – Access Control – Firewalls, Intrusion Detection systems – Encryption and public key infrastructure – Case studies-Enterprise Resource Planning – Introduction – Related Technologies – ERP Modules – Benefits of ERP – ERP Market – ERP Implementation Lifecycle – Future Directions in ERP – ERP Case studies:

- Design & Development of Human Resource Information Systems for an Educational Institution
- Design & Development of Marketing Information Systems for an Company
- Design & Development of Financial Information Systems for an Enterprise.
- Design & Development of Information Systems
- A study of Enterprise Information Planning Systems in a Company **8 Hrs**

Reading:

1) Kenneth C. Laudon& Jane P.Laudon – Management Information Systems-Managing the Digital Form-Eighth Edition, Eastern Economy Edition
2) Alexis Leon, Enterprise Resource Planning – Tata McGraw Hill Publishing Co. Ltd., New Delhi – 2005
3) Raymond Meleod, JR Information Systems – Mac Millan Publishing Co. ltd – 4th Edition.
4) Gerald V.Post David L. Anderson, Management Information System-Solving Business Problems with Information Technology – Tata McGraw Hill Publishing Co. ltd, New Delhi
5) GordanB.DavisMargretteH.Olsan, Management Information System, Conceptual Foundations, Structure & Development – Second Edition – Tata McGraw Hill Co. Ltd, New Delhi

MINI PROJECT II – Cloud Computing

Course Code	: SCS26	Credits	: 03
L:P:T:S	: 0:3:0:0	CIE Marks	: 50
Exam Hours	: 03	SEE Marks	: 50

Students are expected to independently identify a problem related to the field of Cloud Computing, and carry out a mini project on the problem defined. Projects should be coded (or programmed) individually and independently. The code developed towards the project will be reviewed by a panel of examiners at multiples levels. Plagiarized projects will automatically get an **"F" GRADE** and the student will be liable for further disciplinary action. At the completion of a project, the student is to submit a project report and make a presentation, which will be evaluated (end semester assessment) by duly appointed examiner