APPENDIX A

FINAL YEAR: INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2016-17)

SEMESTER –VII

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P#	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 7.1	Image Processing	3	1	2	3	100	25	--	--	--	**125**
IT 7.2	Principles of Compilers	3	1	2	3	100	25	--	25	--	**150**
IT 7.3	Mobile Computing	3	1	2	3	100	25	--	--	25	**150**
IT 7.4	Elective-I	3	1	2	3	100	25	--	--	25	**150**
IT 7.5	Elective-II	3	1	-	3	100	25	--	--	--	**125**
IT 7.6	Project	--	--	4	--	--	--	--	--	25	**25**
TOTAL		**15**	**05**	**12**	**--**	**500**	**125**	**--**	**25**	**75**	**725**

A candidate is considered to have successfully fulfilled the requirement of a semester, provided he/ she submits to the department a certified journal reporting the experiments conducted during the semester.

List of Electives

Subject Code	Elective-I	Subject Code	Elective-II
IT 7.4 .1	Embedded System Design	IT 7.5.1	Geographical Information System
IT 7.4 .2	Genetic Algorithms	IT 7.5.2	Computer Forensics
IT 7.4 .3	Bio Informatics	IT 7.5.3	Digital Signal processing
IT 7.4 .4	Electronic Commerce	IT 7.5.4	IT Business Methodology

FINAL YEAR: INFORMATION TECHNOLOGY

SCHEME OF INSTRUCTION AND EXAMINATION

(RC 2016-17)

SEMESTER –VIII

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P#	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 8.1	Distributed System	3	1	2	3	100	25	--	--	25	**150**
IT 8.2	Computer Cryptography and Network Security	3	1	2	3	100	25	--	25	--	**150**
IT 8.3	Elective-III	3	1	2	3	100	25	--		--	**125**
IT 8.4	Elective-IV	3	1	2	3	100	25	--	--	25	**150**
IT 8.5	Project*	--	--	8	--	--	--	75	--	75	**150**
TOTAL		**12**	**04**	**16**	**--**	**400**	**100**	**75**	**25**	**125**	**725**

* Term Work in Project is a separate Head of Passing.

A candidate is considered to have successfully fulfilled the requirement of a semester, provided he/ she submits to the department a certified journal reporting the experiments conducted during the semester.

List of Electives

Subject Code	Elective-III	Subject Code	Elective-IV
IT 8.3.1	Web Services	IT 8.4.1	VLSI Design
IT 8.3.2	Natural Language Processing	IT 8.4.2	Cloud Computing
IT 8.3.3	Fuzzy Logic and Neural Networks	IT 8.4.3	Advanced Computer Architecture
IT 8.3.4	Advanced Data Structures and Algorithms	IT 8.4.4	Storage Area Networks

APPENDIX B

IT7.1 IMAGE PROCESSING

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	ThDuration(Hrs)	Marks					
						Th	S	TW	P	O	Total
IT7.1	Image Processing	3	1	2	3	100	25	--	--	--	**125**

Course Objectives:

1. To focus on imparting knowledge about the conceptual and practical aspects of Image Processing.
2. To analyze the basic principles and mathematical preliminaries behind Image Processing Techniques.
3. To know signal Processing aspect in Image Processing.
4. To formulate the importance of colour image processing and understanding its usage.

Course Outcomes:

The student after undergoing this course will be able to:

1. Describe the theory underlying basic techniques of Image Processing with detailed instruction for their application.
2. Understand the concepts and principles of the Image Processing Techniques like image enhancement, restoration, compression and segmentation.
3. Be able to implement basic Image Processing algorithms.
4. To carry out simulations for various processes in Image Processing.

UNIT -1 (12 Hours)

Introduction to Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

Elements of Visual Perception – Structure of the human eye, image formation in the eye, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition. Basic concepts in sampling and quantization, representing digital image. Some Basic Relationships between Pixels – neighbors of a pixel, adjacency, connectivity, regions, boundaries, distance measure.

Basics of intensity transformation and spatial filtering. Some Basic Intensity Transformation Functions – Image negatives, log transformation, power law transformations, piecewise – linear transformation functions. Histogram Processing - Histogram Equalization, fundamentals of Spatial filtering – mechanics of spatial filtering, spatial correlation and convolution. Smoothening spatial filtering – Smoothening linear filter.

UNIT - 2 (12 Hours)

Filtering in the frequency domain: Samping and the fourier transform of sampled function, sampling theorem, aliasing. Properties of 2D discrete fourier transform – relationship between spatial and frequency intervals, translation and rotation, periodicity, symmetry properties, fourier spectrum and phase angle, 2D convolution theorem. Image smoothening using frequency domain filters – ideal low pass filters, Butterworth lowpass filters, Gaussian lowpass filters. Image sharpening using frequency domain filters – ideal high pass filter, Butterworth highpass filter, Gaussian high pass filter.

A Model of the Image Degradation/Restoration Process. Noise Models – spatial and frequency properties of noise, periodic noise, estimation of noise parameters. Restoration in the Presence of Noise only (spatial filtering) - Mean Filters, Order-Statistics Filters, adaptive filters. Minimum Mean Square Error (Wiener) Filtering.

UNIT - 3 (12 Hours)

Color Fundamentals. Color Models – the RGB color models, the CMY and CMYK color models, the HSI color models. Basics of Full-Color Image Processing. Image Segmentation based on color – segmentation in HSI color space, segmentation in RGB vector space, color edge detection.

Wavelets and multiresolution processing: Image pyramids, subband coding, the Haar transform.

Image compression: Some basic compression method – Huffman coding.

Morphological Image Processing: Erosion and Dilation – erosion, dilation, duality. Opening and Closing, The Hit-or-Miss Transformation. Some Basic Morphological Transformation. Some Basic Morphological Algorithms – boundary extraction, hole filling, extraction of connected components, convex hull, thinning, thickening, skeletons and pruning.

Image segmentation: point, line and edge detection – detection of isolated points, line detection. Thresholding – foundation and Basic Global thresholding. Region based segmentation – region growing, region splitting and merging.

UNIT - 4 (12 Hours)

Representation and Description: Representation – Boundary following, chain codes, polygonal approximation using minimum parameter polygons. Boundary Descriptors – simple discriptors, shape numbers, Fourier descriptors, statistical moments. Regional descriptors - Some Simple Descriptors, topological descriptors.

Object Recognition: Patterns and Pattern Classes. Recognition Based on Decision-Theoretic Methods - Matching, Optimum Statistical Classifiers. Structural Methods - Matching Shape Numbers, String Matching.

Recommended Readings:

1. R.C. Gonzalez, R.E. Woods;Digital Image Processing; Pearson Prentice Hall; 2009; Third Edition.
2. A.K. Jain; Fundamentals of Digital Image Processing; PHI;
3. Milan Sonka, Vaclav Hlavac, Roger Boyle; Image Processing, Analysis and Machine Vision;
4. W.K. Pralt; Digital Image Processing; McGraw Hill;

List of Experiments in Image Processing and Pattern Recognition:

1. Introduction to image processing and pattern recognition
2. Create image in Java
3. Convert a colored image to grayscale image
4. Zooming and shrinking of an image
5. Negative of an image
6. Threshold of an image
7. Histogram of an image
8. Image smoothening
9. Erosion and dilation

IT 7.2 PRINCIPLES OF COMPILERS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 7.2	Principles of Compilers	3	1	2	3	100	25	-	25	-	**150**

Course Objectives:

1. To introduce essential theory, algorithms, and tools used in compiler construction.
2. To study the design of lexical, syntax, and semantic analysis of source files.
3. To study the construction of syntax trees, and symbol tables.
4. To understand code generation and optimization techniques.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand how compilers translate source code to machine executable.
2. Utilize tools to automate compiler construction such as LEX and YACC
3. Comprehend how to perform parsing (top down and bottom up).
4. be familiar with techniques for simple code optimizations.
5. Have the knowledge to design, implement, and test a compiler for a simple language.

UNIT - 1 (12 Hours)

A language processing system, an overview of Assemblers, Macro processors, Linkers, Loaders, Debugger, Text editor, Compiler, Interpreter.
Introduction to Language Translator, Phases of compilation, Bootstrapping and Porting, Compiler writing tools.
The role of a lexical analyser. Design of lexical analyzer. Implementation of lexical analyzer.
A Language for specifying lexical analyzer. Study of the features and applications of LEX/FLEX tool.

UNIT - 2 (12 Hours)

Overview of Context free grammar. Derivations and Parse trees, Ambiguity, Left recursion, Left factoring.
Top down parsing: Recursive descent parsing and Predictive parsers.
Bottom up parsing: Shift-reduce parsers. Operator precedence parsers, LR parsers.

Study of YACC Tool: Programming with YACC. Combining YACC and FLEX.

UNIT - 3 (12 Hours)

Intermediate Code Generation: Intermediate Language, Declarations, Assignment statements, Boolean expressions, Case statement, Procedure call.
Run Time environments: Source language issues, Storage organization, Storage allocation strategies.
Symbol tables: The content of a symbol table, Data structures for Symbol Table, Representing scope information.
Error detection and recovery: Lexical phase errors, Syntactic phase errors, Semantic errors.

UNIT - 4 (12 Hours)

Code generation: Issues in the design of a code Generator, Basic blocks and flow graphs, Next-use information, A simple Code generator, The DAG representation of Basic blocks, Peephole Optimization, Generating code from DAGS.

Code optimization: The principle sources of optimization, Optimization of basic blocks, Machine dependent optimization, Register allocation optimization.

Recommended Readings:

1. Aho and Ulman ; Principles of Compiler Design; Narosa publishing House, ISBN: 81-85015-61-9
2. Aho, Ulman and Sethi; Compilers, Principles, techniques and tools; Pearson Education Asia, ISBN: 81-7808-046-X.
3. Vinu V. Das ; Compiler design with FLEX and YACC; PHI publication, ISBN:978-81-203-3251-5
4. Louden; Compiler Construction, Principles and Practice; Galgotia Publication, ISBN:0-534-93972-4

List of Experiments in Principles of Compilers:

(At least 8 experiments should be conducted from the list of experiments. A certified journal reporting the experiments conducted should be submitted at the end of the term)

1. A program to detect tokens from user defined expression.
2. A LEX program to find if the input is integer, real number or word.
3. A LEX program to add line numbers for given text.
4. A LEX program to convert decimal numbers to hexadecimal numbers.
5. A LEX program to compute average of given set of numbers.
6. A YACC program to parse an expression for a given grammar.
7. A program that combines YACC and LEX.
8. A program to obtain First and Follow for a user specified grammar.
9. A program to obtain Leading and Trailing for a user specified grammar.
10. To implement code generation algorithm

IT 7.3 MOBILE COMPUTING

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	ThDuration(Hrs)	Marks					
						Th	S	TW	P	O	Total
IT7.3	Mobile Computing	3	1	2	3	100	25	--	--	25	**150**

Course Objectives:

1. To understand the basic concepts and principles in mobile computing.
2. To be acquainted of the major layers of the mobile protocol stack.
3. To learn the basics of the major telecommunication systems GSM and DECT.
4. To understand the basic concepts of the various classes of satellites.
5. To be exposed to the concepts of Bluetooth and Wireless LAN

Course Outcomes

After completing the course the students will be able to:

1. Explain the basics of mobile telecommunication systems
2. Choose the best solution for each layer of the mobile protocol stack.
3. Describe the fundamentals of GSM and DECT telecommunication systems.
4. Identify the problems and their solutions for mobile network layer and mobile transport layer.
5. Describe the essentials of Satellite systems, Bluetooth and WAP.

UNIT - 1 (12 Hours)

Introduction: Applications, Simplified Reference model.
Wireless Transmission: Frequencies for Radio Transmission, Signals, Antenna, Signal Propagation, Multiplexing, Modulation, Spread spectrum, Cellular systems.

UNIT - 2 (12 Hours)

Medium Access Control: Motivation for a specialized MAC, SDMA, FDMA. TDMA, CDMA, Comparison of S/T/F/CDMA.
Telecommunication System: GSM , DECT.

UNIT - 3 (12 Hours)

Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Mobile ad-hoc networks.
Mobile Transport Layer: Traditional TCP, Classical TCP improvements, TCP over 2.5/3G wireless networks, Performance Enhancing Proxies.

UNIT - 4 (12 Hours)

Satellite Systems: History, Applications, Basics, Routing, Localization, Handover.
Wireless LAN :Bluetooth.
Support for Mobility: Wireless Application Protocol (version 1.x).

Recommended Readings:

1. Mobile Communications by Jochen Schiller, Second Edition, Pearson Education, ISBN: 978-81-317-2426-2.
2. Fundamentals of Mobile Computing by Prasant Kumar Pattnaik, Rajib Mall, Second Edition, PHI Learning Private Limited, ISBN: 978-81-203-5181-3.
3. Wireless Communication Networks and Systems by William Stallings, Copy Beard, Global Edition, Pearson Education, ISBN-13: 978-1-292-10871-1.
4. Mobile Computing Handbook by Mohammad Ilyas, ImadMahgoub, First Edition, CRC Press, Auerbach Publications, ISBN: 0-8493-1971-4.
5. AdHoc Mobile Wireless Networks by C.K. Toh, Pearson Education, Second Edition, ISBN-13: 978-0130078179

List of Experiments:

1. Case Study: The Simplified Reference Model.
2. Case Study: Frequencies for radio Transmission.
3. Program to implement Minimum Shift Keying (MSK).
4. Case Study: Medium Access Control
5. Program to check orthogonality and autocorrelation of codes.
6. Case Study: Global System for Mobile Communications (GSM).
7. Case Study: Mobile IP
8. Case Study: Classical TCP improvements
9. Build an ad-hoc network using different Bluetooth devices.
10. Design a webpage using WML and WMLScript.

IT 7.4.1 EMBEDDED SYSTEM DESIGN

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
					Th Duration (Hrs)	Marks					
		L	T	P		Th	S	TW	P	O	Total
IT 7.4.1	Embedded System Design	3	1	2	3	100	25	-	-	25	150

Course Objectives:

The subject aims to provide the student with:

1. To conceptualize the basics of embedded systems.
2. To conceptualize the basics of organizational and architectural issues of a microcontroller
3. To learn programming techniques used in microcontroller
4. To understand fundamentals of real time operating system

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain about microcontrollers embedded processors and their applications
2. to write the programs for microcontroller.
3. Describe the role of embedded systems in industry.

UNIT – 1 (12 Hours)

Introduction to Embedded Systems:
Overview of Embedded System Architecture, Application areas, Categories of embedded systems, specialties of embedded systems. Recent trends in embedded systems. Brief introduction to embedded microcontroller cores CISC, RISC, ARM, DSP and SoC (System on Chip).

The Microcontroller Architecture:
Introduction to 8051 Microcontroller, Architecture, Pin configuration, Memory organization, Input /Output Ports, Counter and Timers, Serial communication, Interrupts.

UNIT – 2 (12 Hours)

Assembly Language Programming of 8051:
Instruction set, Addressing modes, Development tools, Assembler Directives, Programming based on Arithmetic & Logical operations, I/O parallel and serial ports, Timers & Counters, and Interrupt Service Routine.

UNIT – 3 (12 Hours)

Embedded / Real Time Operating System:
Architecture of kernel, Task and Task scheduler, Interrupt service routines, Semaphores, Mutex, Mailboxes, Message queues, Event registers, Pipes, Signals, Timers, Memory management, Priority inversion problem. Off-the-Shelf Operating Systems, Embedded Operating Systems, Real Time Operating System (RTOS) and Handheld Operating Systems.

UNIT – 4 (12 Hours)

Embedded System - Design case studies: Digital clock, Battery operated smart card reader, Automated meter reading system, Washing Machine, Microwave Owen, Automotive Embedded Systems

Embedded software development tools: Code generation tools, Simulator, Testing and debugger, Integrated Development Environments (IDE) for 8051 systems, Memory and Processor sensitive program and device drivers.

Recommended Readings:

1. M. A. Mazidi, J. G. Mazidi, R. D. McKinlay; The 8051 microcontroller & Embedded systems; , Pearson
2. Kenneth J. Ayala, Dhananjay V. Gadre; . The 8051 microcontroller & Embedded systems; Cengage Learning.
3. Dr. K. V. K. K. Prasad; Embedded / real – time systems: concepts, design & programming, Black Book; Dreamtech press, Reprint edition 2013.
4. Raj Kamal; Embedded System: architecture, programming and design; TMH.
5. Frank Vahid; Tony Givargis,;John Wiley; Embedded System Design;
6. Laya B. Das, Pearson; Embedded systems an integrated approach;
7. Frank Vahid,;Tony Givargis;Embedded system design A Unified hardware/software Introduction.
8. Shibu K.V; Introduction to Embedded Systems; Mc Graw Hill

List of Experiments:

(At least 8 experiments should be conducted based on the broad areas listed below)

Using Keil

1. Write a program to send ASCII values 0,1,2,3,4,5,6,7,8,9,a,b,c,d,e to port 1
2. Write a program to toggle the bits of P1
3. Write a program to send and receive data serially
4. Programming based on arithmetic operations in 8051
5. Programming based on logical operations in 8051
6. Programming based on timers in 8051
7. Programming based on interrupts in 8051

Based on RTOS

1. To implement Shortest Job First Scheduling algorithm
2. To implement Priority Inheritance Protocol
3. Case Study: Reliability & Fault tolerance in RTOS

Case Study on Embedded System

1. Digital clock,
2. Battery operated smart card reader,
3. Automated meter reading system,
4. Washing Machine,
5. Microwave Owen,
6. Automotive Embedded Systems

IT 7.4.2 GENETIC ALGORITHMS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
					Th Duration (Hrs)	Marks					
		L	T	P		Th	S	TW	P	O	Total
IT 7.4.2	**GENETIC ALGORITHMS**	**3**	**1**	**2**	**3**	**100**	**25**	**-**	**-**	**25**	**150**

Course Objective:

The subject aims to provide the student with:

1. Understanding of genetic algorithm.
2. Learn different genetic algorithms and their industrial application.
3. Know to assess the suitability of genetic algorithms for specific problems

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the fundamentals of genetic algorithm and how it can use in search problem to find approximate solution.
2. Identify which problem can be solved using genetic algorithm.
3. Apply the Advanced concepts of genetic algorithm in search problem and optimization

UNIT – 1 (12 Hours)

Introduction to Genetic Algorithms: Robustness of Traditional Optimization and Search Methods, Goals of Optimization, Difference between Genetic Algorithms and Traditional Methods, Simple Genetic Algorithm and its major operators, Example using Genetic Algorithm, Similarity Templates Schemata.

Mathematical Foundations: Fundamental theorem, Schema Processing, Two-armed and K-armed bandit problem, Building block hypothesis, Minimal deceptive, Similarity templates as hyper planes.

UNIT – 2 (12 Hours)

Computer Implementation of Genetic Algorithms: Data structures, Reproduction, crossover and mutation, mapping objective functions to fitness form, Fitness scaling.

Applications Of Genetic Algorithms: De Jong and Function optimization, Structural optimization via genetic algorithm, Medical image registration with genetic algorithms, Iterated prisoner's dilemma problem.

UNIT – 3 (12 Hours)

Advanced Operators And Techniques In Genetic Algorithm Search: Dominance, Diploidy and Abeyance, Inversion and other Re-ordering Operators, Macro operators, Niche and Specialization, Multi objective optimization.

Knowledge based techniques, Genetic Algorithms and Parallel processors, Genetic Based machine learning, Classifier systems.

UNIT – 4 (12 Hours)

Industrial Application Of Genetic Algorithms: Data Mining using genetic Algorithms, Approaches to search in data mining.

Genetic Algorithm Specifics.

Recommended Readings

1. David E. Goldberg, Genetic Algorithms in search, optimization machine learning Pearson Education, 6th Edition ISBN 81-7808-130-X
2. Charles L Karr and L. Michael Freeman, Industrial applications of Genetic Algorithms, CRC Press, Washington DC, 1999 ISBN: 0-8493-9801-0
3. Intelligent agent's adaptive control: Industrial applications- L.C. Jain and C.W.de Silva
4. Handbook of Genetic Algorithms -Davis, Lawrence, ISBN:0-442-00173-8.
5. An Introduction to Genetic Algorithms-Melanie Mitchell, ISBN: 81-203-1358-5

Experiment List

(At least 8 experiments should be conducted based on the broad areas listed below)

1. Case study on traditional and Genetic Algorithmic approach.
2. Program to implement Cross over and mutation operations.
3. Program to map an objective functions to fitness form.
4. Program on inversion and Re-ordering operators.
5. Program to find minimum of a function using genetic algorithm.
6. Program on constraint minimization using genetic algorithm.
7. Program to implement classifier using genetic algorithm.
8. Case study on the industrial applications of the genetic algorithms

IT 7.4.3 Bio Informatics

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
					Th	Marks					
		L	T	P	Duration (Hrs)	Th	S	TW	P	O	Total
IT 7.4.3	Bio Informatics	3	1	2	3	100	25	--	--	25	**150**

Course Objectives:

The subject aims to provide the student with:

1. An ability to understand the broad scope of Bioinformatics.
2. An understanding of the theory and practices of computational methods of Bioinformatics.
3. An understanding of how to demonstrate the basic programming tools used in the field of genomics.
4. An ability to observe various tools used in Bioinformatics
5. A keen interest in Bioinformatics

Course Outcomes:

The student should be able to:

1. Implement Methods used in Bioinformatics.
2. Study Genome Analysis and Gene Mapping.
3. Compare Phylogenetic Analysis and Sequence Analysis.
4. Analyze various algorithms used in Bioinformatics
5. Apply various Tools used in Bioinformatics.

UNIT -1 (12 hours)

Introduction to Bioinformatics: Introduction, Historical Overview and Definition, Bioinformatics applications, Major databases in bioinformatics, Data Management and Analysis, Molecular Biology and Bioinformatics, Central Dogma of Molecular Biology**.**

Information Search and Data Retrieval: Tools for web search,Data Retrieval Tools,Data Mining of biologicaldatabases.

Genome Analysis and Gene Mapping: Genome Analysis, Gene Mapping, The Sequence AssemblyProblem, Genetic Mapping and Linkage Analysis, Physical Maps,

Cloning Entire Genome,Genome Sequencing, Applications of Genetic Maps, Sequence Assembly Tools, Identification of Tools in Contigs, Human Genome Project.

UNIT -2 (12 hours)

Sequence Alignment : Dot matrices and Hash coding, Dynamic programming in sequence algorithm, BLAST, FASTA.

Alignment of Multiple Sequences and Phylogenetic Analysis: Methods of multiplesequence alignment, Evaluating Multiple alignments, Applications, Phylogenetic Analysis, Methods of Phylogenetic Analysis, Tree evaluation, Problems in Phylogenetic Analysis, Dual automated tools.

UNIT -3 (12 hours)

Profiles and Hidden Markov Models: Using Profiles, Hidden Markov Models.
Gene Identification and Prediction: Basics of Gene Prediction, Pattern Recognition, Gene Prediction methods, Other Tools.
Gene Expression and Microarrays: Working with DNA Microarrays, Clustering Gene Expression Profiles, Data sources and tools for microarrays analysis, Applications – Functional Genomes, Comparative Genomics, Medical Applications, Microarrays in Pharmaceutical industries, DNA Microarrays.

UNIT -4 (12 hours)

Determination and Analysis of Molecular Structures: Experimental structure determination technique, Visualization and representation of molecular structure, Geometrical analyses of structures.
Protein Classification and Structure Visualisation: Overview of protein structure, Protein Structure Visualisation, Structure based protein classification, Protein Structure databases, Protein Structure Visualisation Database andTools, Protein Structure Alignment, Domain Architecture Databases, Tools for Plotting Protein-Ligand Interaction, Protein ClassificationApproach.
Introduction to Drug Discovery: Areas influencing drug discovery, Pharmacogenetics and Pharmacogenomics applications, Analysis of Single Nucleotide Polymorphism, Important parameters in Drug Discovery.

Recommended Readings:

1. Bioinformatics – Methods and Applications, S.C. Rastogi, N. Mendiratta and P. Rastogi,4th Edition, PHI, ISBN: 8120325826 ISBN-13: 9788120325821, 978-8120325821

2. Bioinformatics-Databases and Algorithms, by N.Gautham, Narosa Publication ISBN: 81-7319-715-6
3. Bioinformatics- A Beginner's Guide, Jean-Michel Claveriw, Cerdric Notredame WILEY dreamtech India Pvt. Ltd, ISBN:81-265-0380-7
4. Introduction to Bioinformatics, Arthur M. Lesk, OXFORD publishers (Indian Edition)ISBN-10: 0199251967 ISBN-10: 0199251967
5. Introduction to Bioinformatics, T K Attwood & D J Parry-Smith Addison Wesley Longman, ISBN 0 582 327881

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. To implement sequence alignment using hash coding.
2. To implement Pairwise sequence alignment.
3. To implement Sequence similarity searching for sequences.
4. To implement multiple sequence alignment.
5. To implement Phylogenetic analysis using distance based method.
6. To implement evaluation of trees.
7. To implement microarray image analysis.
8. To implement prediction of secondary structure of proteins.
9. To implement sequence based prediction.
10. To validate 3D protein structure.

IT 7.4.4 Electronic Commerce

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 7.4.4	Electronic Commerce	3	1	2	3	100	25	-	-	25	**150**

Course Objectives:

1. To develop an understanding of different business models of E-Commerce.
2. To develop an understanding of Electronic Payment Systems.
3. To develop an understanding of Elements of Supply Chain.
4. To develop an understanding of Security in E-Commerce.

Course Outcomes:

The student after undergoing this course will be able to:

1. Students would be able to analyze the concept of electronic market and market place.
2. Students would be able to understand the different Business Models.
3. Students would be able to understand different types of security threats in E-Commerce.
4. Students would be able to understand the different Applications of E-Commerce.

UNIT - 1 (12 Hours)

Introduction to Electronic Commerce: Defining E-Commerce, Components and Features of E-Commerce, Forces Fueling E-Commerce, Electronic Commerce Industry Framework, The Information Superhighway, Multimedia Content and Network Publishing, Messaging and Information Distribution, Common Business Services Infrastructure, Other Key Support Layers, Traditional Commerce versus E-Commerce, Advantages and limitation of E-Commerce, Benefits to Organization and Society, Drivers of E-Commerce, Categories of E-Commerce, E- Business, E-Business versus E-Commerce, E-Business advantages, E-Business application, Concept of EDI.

Planning and Launching of Online Business: Business Models, Advantages of Bricks and Clicks business model, Superiority of bricks and clicks over pure online model, Difference between brick and mortar and pure online business model, Launching online business, Life cycle approach for launching an online business, One to One Enterprise.

UNIT - 2 (12 Hours)

Electronic Payment System: Traditional payment systems, Internet based payment system, Essential requirements of E-Payment System, Credit cards, Debit cards, Smart cards, EFT, Electronic or Digital Cash, E-Cheques, E Wallet, Consumer, Legal, and Business Issues.

Payment Gateways: Payment gateway process, Advantages and Disadvantages of Payment Gateway, Secure Electronic Transaction Protocol, Types of Payment Gateway: Cyber Cash, Net Bill, First Virtual Holdings and Virtual PIN.

Electronic Commerce and Banking: Changing Dynamics in the Banking Industry Open versus Closed Models, Management Issues in Online Banking, Differentiating Products and Services, Managing Financial Supply Chains, Pricing Issues in Online Banking, Marketing Issues, Back-Office Support for Online Banking.

UNIT - 3 (10 Hours)

Applications of E-Commerce: Business to Business, Business within Business, Customer to Business, Applications of E-Commerce in Retailing, Economic viability of an Online Firm, Financial Analysis, Business models of E-tailing, Service Sector: Online travel services, Online Career Industry, Online Insurance services.

Electronic Commerce and Retailing: Changing Retail Industry Dynamics, Mercantile Models from the Consumer's Perspective, Types of Purchases, Types of Consumers, Management Challenges in Online Retailing.

Intranets and Supply-Chain Management: Supply-Chain Management Fundamentals, Pull versus Push Supply-Chain Models, Elements of Supply-Chain Management, Integrating Functions in a Supply Chain, Managing Retail Supply Chains, The Order Management Cycle (OMC).

UNIT - 4 (10 Hours)

Intranets and Customer Asset Management: Challenges in Implementing Customer Asset Management, Customer Asset Management and Supply Chains, Online Sales Force Automation, Elements of Online Sales Automation, Intranets and Sales Automation, Management Issues, Online Customer Service and Support - The Web and Customer Service, The Role of Technology in Customer Service, Technology and Marketing Strategy, Marketing Decision Support Systems, Marketing Decision Support Applications.

Security in E-Commerce: Introduction, Threats to Internet Security, Types of Threats, Security System on Internet, Network Security, Client Server Network Security, Data and Transmission Security, Firewalls, Security Protocols.

Recommended Readings:

1. Nidhi Dhawan; Introduction to E-Commerce; International Book House Pvt. Ltd; 2010
2. Ravi Kalakota & Andrew B. Whinston; E-Commerce; Pearson Education India

List of Experiments in E-Commerce:

(At least 8 experiments should be conducted from the list of experiments. A certified journal reporting the experiments conducted should be submitted at the end of the term)

1. An analysis of Different Ecommerce Websites
2. A Survey on Online Payment Method
3. Study of E-Commerce Softwares
4. A Survey on Enterprise Resource Planning(ERP)
5. Mini Project: Designing of E-Commerce Website
6. Case Study: Amazon.in
7. Case Study: Online Banking in India
8. Case Study: SCM in India
9. Case Study: E-Business in Action

IT 7.5.1 GIS GEOGRAPHICAL INFORMATION SYSTEM (Elective II)

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
					Th	Marks					
		L	T	P	Duration (Hrs)	Th	S	TW	P	O	Total
IT 7.5.1	Geographical Information system	3	1	-	3	100	25	--	--	--	**125**

Course Objective:

1. Understand the purposes of GIS and the kinds of problems to which GIS is applied.
2. Understand maps and way it is represented in digital form.
3. Understand the fundamental types of GIS data, including raster and vector data.
4. Understand the basics of data capture, storage, analysis and output in a GIS.
5. Understand the limitations of geographic information systems and of geographic data in general.

Course Outcomes

1. Students are able to explain the concept, terminology and practices of GIS.
2. Students are able to demonstrate how GIS data is digitally represented and how the data is processed.
3. Students are able to design, implement and manage a GIS application.

UNIT 1 (12hrs)

Introduction to GIS: Definitions and related terminology of GIS. Evolution of GIS, Components of GIS, Approaches to the study of GIS.

Maps and GIS : Characteristics of maps, Plane and geographic coordinates, Map projection

Establishing a geo referencing framework for mapping locations of earth, Topographic mapping

Thematic mapping

UNIT 2 (12 hrs)

Digital Representation of Geographic data: Technical issues to digital representation of data

Database and database management system, Raster geospatial data representation

Vector data representation, Object oriented geospatial data representation, Relationship between data representation and data analysis in GIS.

Geospatial Data Quality and Data Standards : Concepts and definition of data quality, Components of geospatial data, Data quality assessment, Managing data spatial errors, Geospatial data standards, Geospatial data standards and GIS development

UNIT 3 (12 hrs)

Raster Geoprocessing : Characteristics of raster geoprocessing**,** Acquiring and handling raster geospatial data**,** Raster geospatial data analysis, Output functions of raster geoprocessing**,** Cartographic modeling,

Vector Geoprocessing: Characteristics of vector geoprocessing, Vector data input functions

Non topological GIS analysis functions, Feature based topological functions, Layer based topological functions, Vector geoprocessing output functions, Approaches to vector geoprocessing.

UNIT 4 (12hrs)

Geo Visualization and Geospatial Information Products: Cartography in the context of GIS, Human computer interaction and GIS, Visualization of geospatial information Principles of cartographic design in GIS, Generation of information product,.

GIS Implementation and Project Management: Software engineering as applied to GIS, GIS project planning, System analysis and user requirement studies, Geospatial database design methodology, System implementations in technology roll out, System maintenance and technical support.

GIS Issues and Prospects: Issues of implementing GIS, The trends of GIS development**.,** Frontiers of GIS research.

Recommended Readings

1. C. P. Lo, Albert K. W. Yeung; Concepts And Techniques Of Geographic Information Systems;2nd Edition, Prentice Hall of India, ISBN-13: 978-0131495029

2. Ian Heywood, Sarah Cornelius, Steve Carver; An Introduction to Geographical Information Systems;4th Edition; Pearson Education, ISBN-13: 978-0273722595

3. George B. Korte; The GIS Book; 5th Edition, Cengage Learning, ISBN-13: 978-8131503997

4. Kang – Tsung Chang; Introduction to Geographical Information Systems;8th Edition, McGraw-Hill Higher Education, ISBN-13: 978-0078095139

IT 7.5.2 COMPUTER FORENSICS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT7.5.2	Computer Forensics	3	1	0	3	100	25	--	--	--	**125**

Course Objective:

The subject aims to provide the student with:

1. Familiarization with the types and categories of Cyber Crime
2. Understand concept and scope of Computer Forensics
3. knowledge and skill required to minimize the occurrence and severity of incidents related to forensics and cyber law.
4. An appropriate level of awareness, knowledge and skill required to minimize the occurrence and severity of incidents related to forensics and cyber law.

Course Outcomes:

Upon completion of this course, student will be able to

1. Describe fundamental computer forensics concepts and procedures.
2. Explain how to recover hidden data for forensic analysis from Windows and Linux/Unix file systems
3. Apply digital forensic tools to discover, collect, preserve and analyze Windows and Linux/Unix digital evidence.
4. Document and report digital evidence to court.

UNIT – 1 (12 Hours)

Computer Forensics Fundamentals: Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources/Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps taken by Computer Forensics Specialists Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement — Computer Forensic Technology — Types of Business Computer Forensic Technology Computer Forensics Evidence and Capture: Data Recovery Defined — Data Back-up and Recovery — The Role of Back-up in Data Recovery — The Data-Recovery Solution.

UNIT – 2 (12 Hours)

Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options — Obstacles — Types of Evidence — The Rules of Evidence — Volatile Evidence — General Procedure — Collection and Archiving — Methods of Collection — Artifacts — Collection Steps — Controlling Contamination: The Chain of Custody Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene —

Computer Evidence Processing Steps — Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image Verification and Authentication: Special Needs of Evidential Authentication — Practical Consideration —Practical Implementation.

UNIT – 3 **(12 Hours)**

Computer Forensics analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions Network Forensics: Network forensics overview, performing live acquisitions, developing standard procedures for network forensics, using network tools, examining the honeynet project. Processing Crime and Incident Scenes: Identifying digital evidence, collecting evidence in private-sector incident scenes, processing law enforcement crime scenes, preparing for a search, securing a computer incident or crime scene, seizing digital evidence at the scene, storing digital evidence, obtaining a digital hash, reviewing a case

UNIT – 4 **(12 Hours)**

Current Computer Forensic tools: Evaluating computer forensic tool needs, computer forensics software tools, computer forensics hardware tools, validating and testing forensics software E-Mail Investigations: Exploring the role of e-mail in investigation, exploring the roles of the client and server in e-mail, investigating e-mail crimes and violations, understanding e-mail servers, using specialized e-mail forensic tools. Cell phone and mobile device forensics: Understanding mobile device forensics, understanding acquisition procedures for cell phones and mobile devices.

Recommended Readings:

1. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi. 2004
2. Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning, 2008
3. Chris Davis, David Cowen & Aaron Philipp; Hacking Exposed Computer Forensics Secrets & Solutions; Tata McGraw-Hill Publishing Company Limited, ISBN 0-07- 059895-9
4. Man Young Rhee; “Internet Security: Cryptographic Principles”, “Algorithms and Protocols”,;Wiley Publications, 2003;
5. Richard E.Smith,;“Internet Cryptography”;3rd Edition Pearson Education; 2008.
6. MarjieT.Britz; “Computer Forensics and Cyber Crime”: An Introduction”; 3rd Edition, Prentice Hall;

IT 7.5.3 Digital Signal Processing

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
					Th	Marks					
		L	T	P	Duration (Hrs)	Th	S	TW	P	O	Total
IT 7.5.3	Digital Signal Processing	3	1	-	3	100	25	--	--	-	**125**

Course Objectives:

1. Understand basic concepts and methodologies in Digital Signal Processing.
2. Understand the fundamental concepts of discrete transforms.
3. Study the applications of Z Transforms.
4. Study of digital filters and their applications.

Course Outcomes

Upon completion of this class, students should be able to:

1. Explain the concepts of signals and systems and the basic operations on them.
2. Analyse the behaviour of periodic and aperiodic signals in frequency domain using the Fourier Series and Fourier Transforms.
3. Describe the concept and characteristics of Z Transforms and its use in the analysis and applications of systems.
4. Explain the techniques of designing of Infinite Impulse Response (IIR) filters and Finite Impulse Response (FIR) filters.

UNIT -1 (12 Hours)

Digital Signal Processing and Its Benefits. Application Areas. Key DSP Operations. Digital Signal Processors. Overview of Real-world Applications of DSP. Telecommunications Applications of DSP. DFT and its Inverse. Properties of the DFT. Computational Complexity of the DFT. The Decimation-in-Time Fast Fourier Transform Algorithm. Inverse Fast Fourier Transform. Implementation of the FFT. Other Discrete Transforms. An Application of the DCT: Image Compression.

UNIT -2 (12 Hours)

Discrete-Time Signals and Systems. The Z-Transform, The Inverse Z-Transform. Properties of the Z-Transform. Some Applications of the Z-Transform in Signal Processing. Correlation and Convolution. Correlation Description. Convolution Description. Implementation of Correlation and Convolution. Application Examples.

UNIT -3 (12 Hours)

Introduction to Digital Filters. Types of Digital Filters: FIR and IIR Filters. Choosing Between FIR and IIR Filters. Filter Design Steps. Introduction. FIR Filter Design. FIR

Filter Specifications. FIR Coefficient Calculation Methods. Window Method. The Optimal Method. Frequency Sampling Method. Comparison of the Window, Optimum and Frequency Sampling Methods. Special FIR Filter Design Topics. Realization Structures for FIR Filters. Finite Wordlength Effects in FIR Digital Filters. FIR Implementation Techniques. Design Example. Application Examples of FIR Filters.

UNIT -4 (12 Hours)

Design of Infinite Impulse Response (IIR) Digital Filters: Summary of the Basic Features of IIR Filters. Design Stages for Digital IIR Filters. Performance Specification. Coefficient Calculation Methods for IIR Filters. Pole-Zero Placement Method of Coefficient Calculation. Impulse Variant Method of Coefficient Calculation. Matched Z-Transform (MZT) Method of Coefficient Calculation. Bilinear Z-Transform (BZT) Method of Coefficient Calculation. Use of BZT and Classical Analog Filters to Design IIR Filters. Calculating IIR Filter Coefficients by Mapping S-Plane Poles and Zeros. Using IIR Filter Design Programs. Choice of Coefficient Calculation Methods for IIR Filters. Realization Structures for IIR Digital Filters. Finite Wordlength Effects in IIR Filters. Implementation of IIR Filters. A Detailed Design Example of an IIR Digital Filter.

Recommended Readings:

1. Digital Signal Processing – by Emmanuel C..Ifeachor, &Barrie.W.Jervis, Second edition, Pearson Education / Prentice Hall, 2002.
2. Digital Signal Processing: Principles, Algorithms, and Applications, by John G. Proakis and Dimitris G. Manolakis, Prentice Hall, 1996
3. Discrete-Time Signal Processing, by Alan V. Oppenheim, Ronald W. Schafer, Prentice Hall, ISBN:0-13-216292-X
4. Digital Signal Processing, A Computer Based approach, by S.K. Mitra, Tata McGraw Hill, 1998
5. Digital Signal Processing by Ramesh Babu, Scitech India publications Limited, Fourth Edition,2007

IT 7.5.4 IT Business Methodology

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 7.5.4	IT Business Methodology	3	1	-	3	100	20	5	-	-	**125**

Course Objectives:

1. To explore the concept of Decision support system.
2. To understand the concept of ERP.
3. To understand the ethical practices in management.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the concept of Management Information system.
2. Differentiate the ERP modules.
3. Describe the ERP Implementation Lifecycle.

UNIT - 1 (10 Hours)

Management Information Systems: Need, Role of managers, Business and technology trends, Reengineering. Transaction management.
Models and Decision Support: Need, Understanding processes, Decision Support Systems (DSS), Executive Information Systems (EIS), Expert Support Systems (ESS), and Building ESS.
Value: Importance, source of value system, types, values, loyalty and ethical behavior, value across culture.
Business ethics: Nature, characteristics and needs, ethical practices in management.

UNIT - 2 (12 Hours)

Business modeling for ERP: Overview, concept, significance and principles of business engineering, BRP, ERP and IT business engineering with IT, ERP and management concerns, building an MIS, Business as a system, core process in a manufacturing company, entities for data model in a manufacturing company, extended ERP.
Enterprise - An Overview: Integrated management information, Business modeling, Integrated business model.

ERP : A Manufacturing Perspective: ERP, CAD/CAM, MRP,BOM, closed loop MRP, MRP-II, JIT and Kanban, PDM, Make To Order, Make To Stock, Assemble To Order, Engineer To Order, Configure To Order.

UNIT - 3 (10 Hours)

ERP Modules: Finance, Plant management, Quality management, Materials management.
Benefits of ERP: Reduction of lead time, On-time shipment, Reduction in cycle time, Improved resource utilization, Better customer satisfaction, Improved supplier, Performance, Increase flexibility, Reduced quality costs, Improved information, accuracy and decision making capability.
ERP Implementation Lifecycle: Pre-evaluation screening, Package evaluation, Project planning phase, Gap analysis, Reengineering, Configuration, Implementation team engineering, Testing, Going live, End-user training, Post implementation.

Vendors, Consultants and users: in-house implementation, Vendors, Consultants, End-users.

UNIT - 4 (8 Hours)

Strategic Analysis: Competitive environment, External agents, IS techniques to gain competitive Advantage, Product Differentiation and new products, Need for innovation, Costs and dangers of strategies, Quality management: Operations, tactics and strategy.

Organizing Businesses and Systems: Production Chain, Disintermediation, Auctions, Entrepreneurship, Planning.

Information management and Society: Individual perspective, Business perspective: Vendor, Consumer, Education and training, Social interaction, Responsibility and ethics.

Recommended Readings:

1. Gerald V. Post and David L. Anderson; Management Information Systems; (TMH).
2. Vinod Kumar Garg, N. K. Venkita Krishna; Enterprise resource planning.
3. Alexis Leon; Enterprise Resource Planning; TMH.
4. Robert G. Murdick, Joel E. Ross and James R. Claggett; Information System for Modern Management; (PHI).
5. S.K Chakraborty; Value and Ethics for Organization.

IT 8.1 DISTRIBUTED SYSTEM

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
					Th Duration (Hrs)	Marks					
		L	T	P		Th	S	TW	P	O	Total
IT 8.1	Distributed System	3	1	2	3	100	25	-	-	25	150

Course Objectives:

The subject aims to provide the student with:

1. Understand the major technical challenges in distributed systems design and implementation.
2. To present the principles underlying the functioning of distributed systems
3. Expose students to past and current research issues in the field of distributed systems
4. Provide experience in the implementation of typical algorithms used in distributed systems

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain what a distributed system is, why you would design a system as a distributed system and what the desired properties of such systems are.
2. List the principles underlying the functioning of distributed systems, describe the problems and challenges associated with these principles, and evaluate the effectiveness and shortcomings of their solutions
3. Recognize how the principles are applied in contemporary distributed systems, explain how they affect the software design, and be able to identify features and design decisions that may cause problems

UNIT – 1 (12 Hours)

Introduction to Distributed System. Goals: Connecting Users and Resources, Transparency, Openness, Scalability. Hardware Concepts: Multiprocessors, Homogeneous Multicomputer Systems, Heterogeneous Multicomputer Systems. Hardware & Software Concepts,Design Issues & Challenges Distributed Operating Systems, Network Operating Systems Middleware.
The Client-Server Model: Clients and Servers, Application Layering, Client-Server Architectures

Layered Protocols: Lower-Level Protocols, Transport Protocols, Higher-Level Protocols. **Remote Procedure Call**: Basic RPC Operation , Parameter Passing , Extended RPC Models, Example: DCE RPC.
Remote Object Invocation: Distributed Objects, Binding a Client to an Object, Static versus Dynamic Remote Method Invocations, Parameter Passing, DCE Remote Objects, Java RMI 95. **Message-Oriented Communication**: Persistence and Synchronicity in Communication, Message-Oriented Transient Communication, Message-Oriented Persistent Communication. Stream-Oriented Communication: Support for Continuous Media, Streams and Quality of Service, Stream Synchronization

UNIT – 2 (12 Hours)

Processes: Introduction to Threads, Threads in Distributed Systems, Clients, User Interfaces, Client-Side Software for Distribution Transparency. Servers- General Design Issues, Object Servers, Approaches to Code Migration, Migration and Local Resources, Migration in Heterogeneous Systems. D'Agents. Software Agents 173, Software Agents in Distributed Systems, Agent Technology
Message Passing Communication: Communication Primitives, Message Synchronization and Buffering, Pipe, Pipe and Socket APIs, Group Communication, Multicasting
Clock Synchronization: Physical Clocks, Clock Synchronization Algorithms, Use of Synchronized Clocks. Logical Clocks: Lamport timestamps, Vector timestamps. Global State. Election Algorithms, The Bully Algorithm, A Ring Algorithm. Mutual Exclusion: Centralized, Distributed, and Token Ring Algorithms. A Comparison of the Three Algorithms. Distributed Transactions: The Transaction Model, Classification of Transactions, Implementation of Concurrency Control

UNIT – 3 (12 Hours)

Introduction to consistency and replication: Reasons for Replication, Object Replication, Replication as Scaling Technique. Data-Centric Consistency Models, Strict, Linearizability and Sequential, Causal, FIFO, Weak, Release, Entry Consistency models: Client-Centric Consistency Models: Eventual Consistency, Monotonic Reads, Monotonic Writes, Read Your Writes, Writes Follow Reads and Implementation. Distribution Protocols: Replica Placement, Update Propagation, Epidemic Protocols, Consistency, Primary-Based, Replicated-Write, Cache-Coherence Protocols
Introduction To Fault Tolerance: Basic Concepts, Failure Models, Failure Masking by Redundancy. Process Resilience: Design Issues, Failure Masking and Replication, Agreement in Faulty Systems. Reliable Client-Server Communication: Point-to-Point Communication, RPC Semantics in the Presence of Failures. Reliable Group Communication: Basic Reliable-Multicasting Schemes, Scalability in Reliable Multicasting, Atomic Multicast. Distributed Commit: Two-Phase Commit, Three-Phase Commit. Recovery: Check pointing, Message Logging.

UNIT – 4 (12 Hours)

Distributed Object-Based Systems: Communication, Processes, Naming, Synchronization, Caching and Replication, Fault Tolerance and security issues with CORBA and DCOM. Comparison of CORBA and DCOM

Distributed File Systems: Communication, Processes, Naming, Synchronization, Caching and Replication, Fault Tolerance and security issues with Sun Network File System

Distributed Document-Based Systems: Communication, Processes, Naming, Synchronization, Caching and Replication, Fault Tolerance and security issues with World Wide Web

Recommended Readings:

1. Andrew S. Tanenbaum and Maarten Van Steen; Distributed Systems: Principles and Paradigms; Prentice Hall, ISBN – 81 – 7808 – 789-8.
2. George Coulouris, Jean Dollimore & Tim Kindberg; Distributed Systems – Concept and Design; Pearson (LPE).; 4th Edition ;ISBN 978-81-317-1840-7.
3. Randay Chow, Theodore Johnson; Distributed Operating System and Algorithm Analysis; Pearson (LPE) ISBN 978-81-317-2859-8

List of Experiments:

(At least 8 experiments should be conducted from the list of experiments.)

1. Program to implement Single Client Single Server Chat Application
2. Program to implement Multiple Clients Single Server Chat Application
3. Program to implement Remote Method Invocation Application
4. Case study on Component Object Model (COM)
5. Case study on Distributed Component Object Model (DCOM)
6. Case study on Common Object Request Broker Architecture (CORBA)
7. Program to implement Berkeley's Algorithm for clock synchronization
8. Case study in generating Interface Definition Language (IDL) in Java using CORBA
9. Program to implement Lamport Timestamps clock synchronization
10. Program to implement Vector Timestamps clock synchronization

IT 8. 2 COMPUTER CRYPTOGRAPHY AND NETWORK SECURITY

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
					Th Duration (Hrs)	Marks					
		L	T	P		Th	S	TW	P	O	Total
IT 8.2	Computer Cryptography and Network Security	3	1	2	3	100	25	-	-	25	150

Course Objectives:

The subject aims to provide

1. An Understanding of different cryptography techniques
2. A study of different cryptography algorithms and perform cryptanalysis
3. Concepts of different network security issues
4. Ability to secure their network and message passed in the network

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain different cryptographic techniques
2. Implement different algorithm for encryption
3. Illustrate how network security is achieved
4. Perform cryptanalysis of different algorithm

UNIT – 1 (12 Hours)

Need of Information Security, Security Trends, Security Services, Security Mechanism, Security Attacks, The OSI Security Architecture, Model for Network Security.

Symmetric Cipher Model- Substitution Techniques : Caesar Cipher, Mono-alphabetic Cipher, Poly-alphabetic Cipher, Playfair Cipher, Hill Cipher, Problems with Symmetric Cipher Algorithms, Transposition Techniques, Steganography. Intrusion Detection, Malicious Software: Viruses and Related Threats, Virus Countermeasures.

UNIT – 2 (12 Hours)

Block Ciphers Principles, Fiestel Structure , Data Encryption Standard, Strength of DES, Block Cipher Modes of Operation, Triple DES. Confidentiality Using Symmetric Ciphers:

Placement of Encryption Function, Traffic Confidentiality, Key Distribution. Principles of Public Key Cryptosystems, RSA Algorithm. Key Management, Diffie-Hellman Key Exchange.

UNIT – 3 (12 Hours)

Message Authentication And Hash Functions: Authentication Requirements, Authentication Functions. Message Authentication Codes. Hash Algorithms: MD5 Message Digest Algorithm, Overview of Secure Hash Algorithm. Digital Signatures and Digital Signature Standard. Authentication Applications: Kerberos, X.509 Authentication Service: Certificates, Obtaining a User's Certificate , Revocation of Certificates , Authentication Procedures.

UNIT – 4 (12 Hours)

Electronic Mail Security: Pretty Good Privacy: Services, Cryptographic Keys and Key Rings, S/MIME: Overview , MIME Content Types , S/MIME Functionality Brief overview of IPSec and SSL/TLS. Secure Electronic Transaction: SET overview, SET Participants, Dual Signature, Payment Processing. Firewall Design Principles , Trusted systems.

Recommended Readings:

1. William Stallings; Cryptography And Network Security Prentice Hall Of India, ISBN:81-203-3018-8 ; 4th Edition
2. Behrouz A. Forouzan; Cryptography And Network Security; Tata McGraw Hill; ISBN-13:978-0-07-066046-5
3. Atul Kahate; Cryptography And Network Security; Tata McGraw Hill; ISBN-13:978-0-07-064823-4

List of Experiments:

(At least 8 experiments should be conducted based on the broad areas listed below)

1. Implementation of Caesar Cipher
2. Implementation of Transposition Cipher
3. Implementation of Play fair Cipher
4. Implementation of Hill Cipher
5. Implementation of one time pad technique
6. Implementation of DES
7. Implementation of RSA
8. Implementation of Stenography
9. Study of Account and password management. PAM, password cracking.
10. Study of Security analysis tools: Nessus, Microsoft baseline security analyzer ,wireshark ,nmap tcpdump, networking commands.

IT 8.3.1 WEB SERVICES

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 8.3.1	Web Services	3	1	2	3	100	25		-	-	**125**

Course Objectives:

1. To learn and understand the various concepts of Web Services.
2. To learn basics of XML which is the basic prerequisite to understand how the different documents of the respective protocols are designed.
3. To learn the different protocols used in web services and their role and importance in designing a web service.

Course Outcomes:

The student after undergoing this course will be able to learn:

1. How information is exchanged between applications within a distributed environment. (SOAP).
2. How the web services are described to the world over internet (WSDL).
3. How the web service is published and made known to the world over the internet. (UDDI).
4. How to explain the conversation pattern that a web service is expecting to engage in. (WSCL)
5. How workflow systems automate business processes. (Workflow).
6. Advantages and Disadvantages of Web Services.
7. Transactions and the transaction protocols used in web service.
8. Security issues in Web Services.

UNIT - 1 (14 Hours)

Web Service and SOA fundamentals: Introduction, Concept of Software as a Service(SaaS), Web services versus Web based applications, Characteristics of Web services, Service interface and implementation, The Service Oriented Architecture(SOA), Quality of service (QoS), Web service interoperability, Web services versus components, RESTful services , Impact and shortcomings of Web services.

Web Services Architecture: Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for

implementing web services, web services communication, basic steps of implementing web services, developing web services enabled applications.

UNIT - 2 (12 Hours)

Extensible Markup Language (XML): XML Fundamentals. XML, XML Documents, XML Namespaces. XML Schema, Processing XML.
XML Parsing: SAX, COM, JAXB. Xpath, XQuery.

UNIT - 3 (14 Hours)

SOAP: Simple Object Access Protocol, Inter-application communication and wire protocols, SOAP as a messaging protocol, Structure of a SOAP message, SOAP communication model, Building SOAP Web Services, developing SOAP Web Services using Java, Error handling in SOAP, Advantages and disadvantages of SOAP.

Describing and Discovering Web Services: WSDL in the world of Web Services, Web Services life cycle, anatomy of WSDL definition document, WSDL bindings, WSDL Tools, limitations of WSDL, Service discovery, role of service discovery in a SOA, service discovery mechanisms, UDDI – UDDI Registries, uses of UDDI Registry, Programming with UDDI, UDDI data structures, support for categorization in UDDI Registries, Publishing API, Publishing information to a UDDI Registry, searching information in a UDDI Registry, deleting information in a UDDI Registry, limitations of UDDI.

UNIT - 4 (12 Hours)

Conversations: Web service conversation Language, WSCL Interface component, Relationship between WSCL and WSDL.
Workflow: Business Process Management, Workflow and workflow Management systems, Business Process Execution Language (BPEL).
Security: Everyday Security Basics, Security Is An End-to-End Process, Web Service Security Issues, Types of Security Attacks and Threats, Web Services Security Roadmap, WS-Security.

Recommended Readings:

1. Michael P. Papazoglou; Web Services & SOA: Principles and Technology; Pearson Education , 2/e,.

2. Harvey M.Dietel & Paul J.Dietel ; Web Services: A Technical Introduction; Prentice Hall PTR, ISBN: 0130461350
3. Sandeep Chatterjee, James Webber; Developing Enterprise Web Services – An Architect's Guide; Pearson Education ISBN: 0-13-140160-2.
4. Stephen Potts, Mike Kopack; Sams Teach Yourself Web Services in 24 Hours; Sams Publications ISBN:13:978-0672325151.
5. R. Nagappan, R. Skoczylas, R.P. Sriganesh; Developing Java Web Services; Wiley India.

List of Experiments in Web Services:

(At least 8 experiments should be conducted from the list of experiments. A certified journal reporting the experiments conducted should be submitted at the end of the term)

1. To implement XML Schema and File
2. To study and implement XML inheritance.
3. To study and implement SOAP and WSDL.
4. To study and implement DOM.
5. To implement XML encryption
6. To implement XML query
7. Creating web service using JAVA
8. Creating web service using .NET
9. Case study on XPath, XJAXB

IT8.3.2. Natural Language Processing

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	ThDuration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT8.3.2	Natural Language Processing	3	1	2	3	100	25	--	--	--	125

Course Objectives:

The subject aims to provide the students with:

1. To understand the basic of Natural Language processing.
2. To develop an understanding of various techniques used in Natural Language Processing and understand the various application areas for NLP.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand the complexities and the key issues involved in NLP
2. Understand various core techniques and their adaptations for NLP
3. Explore and propose different domains in which NLP can be applied efficiently
4. Develop new applications and techniques for NLP

UNIT - 1 (12 Hours)

Regular Expressions, Finite-State Automata , Formal Languages , Non-Deterministic FSAs , Relating Deterministic and Non-Deterministic Automata , Regular Languages and FSAs , Morphology, Finite-State Morphological Parsing , Finite-State Transducers , Sequential Transducers and Determinism. The combination of an FST, Lexicon and Rules , Lexicon-Free FSTs: The Porter Stemmer , Word and Sentence Tokenization , Detection and Correction of Spelling Errors , Minimum Edit Distance Simple (Unsmoothed) *N*-grams , Training and Test Sets , *N*-gram Sensitivity to the Training Corpus

UNIT - 2 (12 Hours)

English Word Classes, Tagsets for English, Part-of-Speech Tagging. Rule-Based Part-of-Speech Tagging, HMM Part-of-Speech Tagging ,Computing the Most-Likely Tag Sequence: Hidden Markov and Maximum Entropy Models: Markov Chains,The Hidden Markov Model, Likelihood Computation: The Forward Algorithm, Decoding: The Viterbi Algorithm, HMM Training: The Forward-Backward Algorithm.Maximum Entropy Models: Background ,Linear Regression, Logistic Regression, Maximum Entropy Modeling., Maximum Entropy Markov Models.

UNIT - 3 (12 Hours)

Formal Grammars: Context-Free Grammars, Sentence-Level Constructions Clauses and Sentences , Treebanks, Heads and Head Finding , Grammar Equivalence and Normal Form, Dependency Grammars, Categorial Grammar, Spoken Language Syntax , Disfluencies and Repair Syntactic Parsing: Top-Down Parsing, Bottom-Up Parsing, CKY Parsing, The Earley Algorithm, Chart Parsing , Partial Parsing Statistical Parsing: Probabilistic Context-Free Grammars, PCFGs for Disambiguation, PCFGs for Language Modeling, The Collins Parser:Features and Unification: Unification of Feature Structures Feature Structures in the Grammar

UNIT - 4 (12 Hours)

The Representation of Meaning: Computational Desiderata for Representations, Canonical Form, Inference and Variables, First-Order Logic, Lambda Notation. The Semantics of First-Order Logic, Inference Information Extraction: Named Entity Recognition, NER as Sequence Labeling Practical NER Architectures, Relation Detection and Classification. Supervised Learning Approaches to Relation Analysis, Temporal and Event Processing, Temporal Expression Recognition, Temporal Normalization . Machine Translation: Typology, Lexical Divergences, Classical MT and the Vauquois Triangle, Direct Translation, Transfer,The Interlingua Idea: Using Meaning, Statistical MT. Using Human Raters , Automatic Evaluation: BLEU, Question Answering and Summarization: Information Retrieval,The Vector Space Model, Evaluation of Information-Retrieval Systems, Homonymy, Polysemy, and Synonymy, Summarization

Recommended readings:

1, Speech and Language processing An introduction to Natural Language Processing, Computational Linguistics and speech Recognition by Daniel Jurafsky and James H. Martin ISBN-13: 978-0131873216
2, “Foundations of Statistical Natural Language Processing” by Chris Manning and HinrichSchuetzeISBN-13: 978-0262133609
3. Natural Language Processing with Python by Steven Bird, Ewan Klein, Edward Lopper ISBN-13: 978-0596516499
4. Handbook of Natural Language Processing, Second Edition--Nitin Indurkhya, Fred J. Damerau, Fred J. Damerau ISBN-13: 978-1420085921

LIST OF EXPERIMENTS:

1) Study of python basics. Getting and setting up various freely available datasets
2) Implement depth first and breadth first search
3) Implement a simple n-gram language model that allows n to vary from two to four
4) Implement a model that uses linear interpolation
5) Implement a model that uses Discounting for n = 1 to 4
6) To implement simple decision tree
7) To implement a simple text classification technique
8) To implement a simple text summarization technique

IT 8.3.3 FUZZY LOGIC AND NEURAL NETWORKS

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	ThDuration(Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 8.3.3	Fuzzy Logic and Neural Networks	3	1	2	3	100	25	--	--	--	**125**

Course Objectives:

1. To provide basic introduction to concepts and methodologies of Fuzzy Logic and Neural Networks.
2. To develop knowledge about the conceptual and practical aspect of Neural Networks and Fuzzy Logic.
3. To develop a foundation that can be used for further research in Fuzzy Logic and Neural Networks.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the basic concept and techniques of Neural Networks.
2. Differentiate between crisp set and fuzzy set.
3. Describe the learning rules used in Neural Networks.
4. Apply the concepts of Fuzzy Logic and Neural networks in practical applications.

UNIT -1 (12 Hours)

History of Neural Networks. Structure and function of a single neuron. Neural Net Architecture. Neural Learning. Common usage of neural networks in classification, clustering, vector quantization. pattern association, function approximation and forecasting. Evaluation of networks. Implementation of neural networks.

Perceptrons. Linear Separability Perceptron Training Algorithm, Guarantee of Success, Pocket algorithm, Adaline. Multilayer networks, Multilevel discrimination, Architecture, objectives and working of Backpropagation algorithm. Setting the parameter values of Backpropagation algorithm. Accelerating learning process and applications of Backpropagation algorithm.

UNIT - 2 (12 Hours)

Prediction tasks using Recurrent Networks and feedforward networks, Radial basis functions. Polynomial networks. Unsupervised learning. Hamming networks, simple competitive learning. counter-propagation network, adaptive resonance theory, Self

organizing maps. Non-iterative procedures for association, Discrete Hopfield Network, Brain-State_in_a_box Network, Boltzmann Machine, Bi-directional Associate memory.

UNIT - 3 (12 Hours)

History and Motivation for Fuzzy Logic. Classical sets, Fuzzy sets, Operations of Fuzzy sets, Properties of Fuzzy sets, A Geometric interpretation of Fuzzy sets, possibility theory. (03 hrs) Fuzzy relations, composition of Fuzzy relations, Fuzzy graphs and numbers, Functions with Fuzzy arguments, arithmetic operations on Fuzzy numbers. Basics of Fuzzy rules, Fuzzy mapping rules, Fuzzy implication rules, Fuzzy rule based models for function approximation, Theoretical foundation of fuzzy mapping rules, Types of fuzzy rule based models: Mamdani model, TSK model, and standard additive model.

UNIT - 4 (12 Hours)

Propositional logic and first order predicate calculus. Fuzzy logic: Fuzzy implication, approximate reasoning, Criteria of Fuzzy implications, Three families of Fuzzy implications. Possibility versus Probability, Probability of a Fuzzy event. Probabilistic interpretation of Fuzzy sets. Fuzzy Logic in Expert Systems. intelligent agents and Mobile robot navigation,. Fuzzy logic in database systems, Fuzzy relational data models and operations, Fuzzy object oriented database. Fuzzy information Retrieval and Web search.

Recommended Readings:

1. Kishan Mehrotra, Chilukuri Mohan, and Sanjay Ranka; Elements of Artificial Neural Networks by Penram International Publishing (India)
2. John Yen and Reza Langari,Fuzzy Logic, Intelligence, Control and Information; Pearson Education
3. Neural Networks and Fuzzy Systems: A dynamical Systems Approach toi Machine Intelligence, by Bart Kosko, PHI
4. Neural Networks: A comprehensive Foundation, - By Simon Haykin, Pearson Education
5. Introduction to Artificial Neural Networks, - By Jacek M. Zurada, Jaico PublishingHouse
6. Neural Networks, Fuzzy Logic, and Genetic Algorithms Synthesis and Applications by S. Rajasekaran, G.A. Vijayalakshmi Pai, PHI

List of Experiments in Data Compression:

(At least 8 experiments should be conducted from the list of experiments. A certified journal reporting the experiments conducted should be submitted at the end of the term)

1. Implementation of basic logic gates using Neural networks
2. Designing a Neural Network to simulate any Boolean function.
3. Implementation of Perceptron Learning Algorithm

4. Implementation of Back propagation Algorithm
5. Implementation of Hebbian rule
6. Implementation of fuzzy set operations.
7. Implementation of fuzzy inference rules.
8. Implementation of an application using Neuro Fuzzy techniques.

IT 8.3.4 ADVANCED DATA STRUCTURES AND ALGORITHMS

Subject code	Name of Subject	Scheme of Instruction Hrs/week			Scheme of Examination						
					Th Duration (Hrs)	Marks					
		L	T	P		Th	S	TW	P	O	Total
IT 8.3.4	Advanced Data Structures and Algorithms	3	1	2	3	100	25	--	--	--	125

Course Objective:

1. To understand the need and use of advanced concepts in data structures.
2. To study the design and implementations of algorithms for advanced data structures.
3. To learn efficient parallel and probabilistic algorithms.

Course Outcomes:

fter completing this course students will be able to:

1. Explain the concepts of advanced data structures.
2. Describe various implementations and operations on advanced data structure concepts like trees, heaps, tries, digital trees etc.
3. Apply different types of parallel and probabilistic algorithms.

UNIT 1 (12 Hours)

Dynamic Hashing, Motivation for Dynamic Hashing, Dynamic Hashing Using Directories. Analysis of Directory-Based Dynamic Hashing Directoryless Dynamic Hashing, Insertion into Min-Max heap, Deletion of Min element, Deaps. Insertion into Deap and Deletion of the Min element, Leftist Trees Binomial Heaps Cost Amortization. Insertion into binomial heap, Combining two binomial heap Deletion of Min Element

UNIT 2 (12 Hours)

Fibonacci Heaps: Insertion, Deletion, Extract Min, Union and Decrease Min operations with Fibinacci Heaps. Search structures: Optimal Binary Search Trees, AVL trees, 2-3 Trees, 2-3-4 Trees,. Red –Black Trees: Definition and properties, Searching, Insertion, Deletions.

UNIT 3 (12 Hours)

B-Trees: Definitions of m-way search trees Searching an m-way search trees Definitions and properties of B-tree Insertion into B-tree Deletion from b-tree Splay Trees Digital search trees, Binary tries Patricia Tries: Searching, Insertions and Deletions,

UNIT 4 (12 Hours)

Introduction to parallelism models :Simple algorithms for parallel computers CRCW and EREW algorithms Brent's theorem and work efficiency. Probabilistic Algorithms: Expected versus average time Pseudorandom generation, Buffon's needle numerical integration, Probabilistic counting, Monte Carlo algorithms

Recommended Readings:

1. Fundamentals of data structures in c++ by Ellis Horowitz,SartajSahni, Dinesh Mehta, Galgotia Publication, ISBN: 817515-278-8
2. Computer Algorithms – Saar Baase. PHI , ISBN: 0201612445
3. Graph Theory with application to engineering and computer science by DeoNarsingh, Charles E Millican. MGh, PHI, ISBN: 978-81-203-0145-0
4. Fundamentals of Algorithms by Gilles Brassard and Paul Bratly. PHI, ISBN: 9780133350685.
5. Computer Algorithms by Horowitz, SartajSahni. Rajasekharan – Galgotia, ISBN: 9788175152571
6. Introduction to algorithms by Thomas H cormen, Charles E Leiserson, Ronald L Rivest. PHI, ISBN: 81-203-1353-4

List of Experiments

Experiment 1 WAP to implement Stack ADT using Linked list with the basic operations as Create(), IsEmpty(), Push(), Pop(), IsFull() with appropriate prototype to a functions

Experiment 2 WAP to implement Queue ADT using Linked list with the basic functions of Create(), IsEmpty(), Insert(), Delete() and IsFull() with suitable prototype to a functions

Experiment 3 WAP to generate the binary tree from the given inorder and postorder traversal.

Experiment 4 WAP to generate the binary tree from the given inorder and preorder traversals

Experiment 5 WAP to store k keys into an array of size n at the location computed using a hash
function, loc = key % n, where k<=n and k takes values from [1 to m], m>n. To handlethe collisions use the following collision resolution techniques,
a. Linear probing
b. Quadratic probing
c. Random probing
d. Double hashing/rehashing
e. Chaining

Experiment 6 BST WAP for Binary Search Tree to implement following operations:
a. Insertion

b. Deletion
i. Delete node with only child
ii. Delete node with both children
c. Finding an element
d. Finding Min element
e. Finding Max element
f. Left child of the given node
g. Right child of the given node
h. Finding the number of nodes, leaves nodes, full nodes, ancestors, descendants.

Experiment 7 (AVL Trees and Red-Black Trees)

I. WAP for AVL Tree to implement following operations: (For nodes as integers)
a. Insertion: Test program for all cases (LL, RR, RL, LR rotation)
b. Deletion: Test Program for all cases (R0, R1, R-1, L0, L1, L-1)
c. Display: using set notation.

Experiment 8 (B-Trees)

I. WAP to implement insertion, deletion, display and search operation in m-way B tree (i.e. a non-leaf node can have atmost m children) for the given data as integers (Test the program for m=3, 5, 7).
II. WAP to implement insertion, deletion, display and search operation in m-way B tree(i.e. a non-leaf node can have atmost m children) for the given data as strings (Test the program for m=3, 5, 7).

Experiment 9 (Min-Max Heaps, Binomial Heaps and Fibonacci Heaps)

I. WAP to implement insertion, deletion and display operation in Min-Max Heap for the given data as integers.
II. WAP to implement Make_Heap, Insertion, Find_Min, Extract_Min, Union, Decrease_Key and Delete_Key operations in Binomial Heap for the given data as strings.

IT8.4.1 VLSI DESIGN (Elective IV)

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	ThDuration(Hrs)	Marks					
						Th	S	TW	P	O	Total
IT8.3.4	VLSI Design	3	1	2	3	100	25	--	--	25	**150**

Course Objective:

1. To study various aspects of VLSI Design
2. To understand working of MOS Transistor under various bias.
3. To understand various semiconductor Technology processes.
4. To understand VHDL.
5. To understand verification Testing of MOS Circuits.

Course Outcomes:

1. To analyse the characteristics of MOS device under dc Bias.
2. To implement Digital Circuits using VHDL.
3. To verify ATPG Techniques on to digital Circuits.
4. To Design circuits for CMOS Transistor.

UNIT -1 (12 Hours)

Introduction, A Brief History, MOS Transistors, CMOS Logic – Inverter, NAND Gate, Combinational Logic, NOR Gate, Compound Gates, Pass Transistors and Transmission Gates, Tristates, Multiplexers, CMOS Fabrication and Layout.
MOS Transistor Theory – Ideal I-V Characteristics, C-V Characteristics – Simple MOS Capacitance Models. Nonideal I-V Effects – Velocity Saturation and Mobility Degradation, Channel Length Modulation, Body Effect, Junction Leakage, Tunneling. DC Transfer Characteristics- Complementary CMOS Inverter DC Characteristics, Beta Ratio Effects, Noise Margin.

UNIT - 2 (12 Hours)

CMOS Processing Technology: CMOS Technologies – Background, Wafer Formation, Photolithography, Well and Channel Formation, Silicon Dioxide, Isolation, Gate Oxide, Gate and Source/Drain Formation, Contacts and Metallization, Passivation, Metrology.
Circuit Characterization and Performance Estimation: Delay Estimation, RC Delay Models – Elmore Delay Model. Power Dissipation – Static Dissipation, Dynamic Dissipation, Interconnect – Resistance, Capacitance, Design Margin – Supply Voltage, Temperature, Process Variation, Design Corners. Reliability – Reliability Terminology, Electromigration, Self-heating, Hot Carriers, Latchup. Scaling – Transistor Scaling Interconnect Scaling Properties

UNIT - 3 (12 Hours)

Combinational Circuit Design: Circuit Families – Static CMOS – Bubble Pushing, Compound Gates, Asymmetric Gates, Skewed Gates. Cascode Voltage Switch Logic, Pass- transistor Circuits – CMOS with Transmission Gates, Complementary Pass Transistor Logic(CPL), More Circuit Families – Differential Circuits (Differential Split-Level and Cascode Nonthreshold Logic), BiCMOS Circuits. Analog Circuits: MOS Small-signal Model, Current Mirrors, Differential Pairs, Simple CMOS Operational Amplifier. CMOS Physical Design Styles: Static CMOS Gate Layout, General CMOS Layout Guidelines. Layout Optimization for Performance.

UNIT - 4 (12 Hours)

Design Methodology and Tools: Design Methodology – Structured Design Techniques, Microprocessor/DSP, Programmable Logic – Programmable Logic Devices, Field Programmable Gate Arrays(FPGA). Testing and Verification: Logic Verification, Basic Digital Debugging Hints. Manufacturing Tests – Manufacturing Test Principles – Fault Models, Observability, Controllability. Fault Coverage, ATPG, Delay Fault Testing. Design For Testability – Built-in Self-Test(BIST). Basic Programming using VHDL.

Recommended Readings:

1. *Ayan Banerjee,David Harris,Neil H.E. West;* **CMOS VLSI Design: A Circuits and Systems Perspective, (Third Edition);** *Pearson Education , 2011*
2. Neil H.E. West and Kamran Eshraghian; Principles of CMOS VLSI Design; Prentice Hall of India, 1995
3. Douglas Pucknell and Kamran Eshraghian ; Basic VLSI Design; Prentice Hall of India, 1990

List of Experiments

1. Introduction to VHDL and VLSI Design
2. Use of NAND and NOR Gates for realizing other gates using VHDL.
3. Design of Half adder and Full adder using VHDL
4. 4: 1 MUX Design using VHDL
5. Solving of a SOP Expression using VHDL
6. Asynchronous D-Flip Flop using VHDL
7. Decade Counter using VHDL
8. Serial Shift Register using VHDL

IT 8.4.2 CLOUD COMPUTING

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 8.4.2	Cloud Computing	3	1	2	3	100	25		-	25	**150**

Course Objectives:

1. Analyze the components of cloud computing showing how business agility in an organization can be created
2. Evaluate the deployment of web services from cloud architecture
3. Critique the consistency of services deployed from a cloud architecture
4. Compare and contrast the economic benefits delivered by various cloud models based on application requirements, economic constraints and business requirements.

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the principles of Cloud Computing.
2. Describe the architecture of Cloud Computing Resources.
3. Demonstrate the applications of Cloud Computing for Business.
4. Apply the skills and knowledge to incorporate agility in an organization.

UNIT - 1 (12 Hours)

Cloud Computing Fundamentals: Cloud Computing definition, private, public and hybrid cloud. Cloud types; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; Business Agility: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications.

UNIT - 2 (10 Hours)

Cloud Applications: Technologies and the processes required when deploying web services; Deploying a web service from inside and outside a cloud architecture, advantages and disadvantages.

UNIT - 3 (12 Hours)

Management of Cloud Services: Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat)

UNIT - 4 (12 Hours)

Cloud IT Model: Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO).

Recommended Readings:

1) Gautam Shroff; Enterprise Cloud Computing Technology Architecture Applications; Cambridge University Press; 1st edition; 2010.
2) Toby Velte, Anthony Velte, Robert Elsenpeter; Cloud Computing, A Practical Approach; McGraw-Hill Osborne Media; 1st edition; 2009.
3) Dimitris N. Chorafas; Cloud Computing Strategies; CRC Press; 1st edition; 2010.

List of Experiments in Cloud Computing:

(At least 8 experiments should be conducted from the list of experiments. A certified journal reporting the experiments conducted should be submitted at the end of the term)

1. To demonstrate practically all the services of the Cloud
2. To develop & deploy our own application on Cloud
3. To install and configure HORTONWORKS SANDBOX HADOOP by using Oracle VirtualBox on Windows Operating System
4. Create an application (Ex: Word Count) using Hadoop Map/Reduce.
5. To Configure & Implement OwnCloud platform to demostrate the concept of PaaS and SaaS.
6. Case Study: PAAS(Facebook, Google App Engine)
7. Case Study: Amazon Web Services.
8. Case Study: Aneka.

IT 8.4.3 ADVANCED COMPUTER ARCHITECTURE

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
		L	T	P	Th Duration (Hrs)	Marks					
						Th	S	TW	P	O	Total
IT 8.4.2	Advanced Computer Architecture	3	1	2	3	100	25	-	-	25	**150**

Course Objectives:

1. To understand concept of parallelism.
2. To give students an insight into the various types of processors and their internal architecture.
3. To familiarize the students, how modern computer systems work and are built.

Course Outcomes:

The student after undergoing this course will be able to:

1. Understand various types of processor along with their internal architecture.
2. Learn how modern systems are built.

UNIT - 1 (12 Hours)

Introduction: Von Neumann architecture, need for high speed computing, how do we increase the speed of computers? Some interesting features of parallel computers**.**

Solving Problems in Parallel: Utilizing temporal parallelism, Utilizing Data Parallelism, Comparison of Temporal and Data Parallel Processing, Data Parallel processing with specialized processors.

Parallel computer structures, Architectural classification schemes, Parallel processing applications

Principles of pipelining: Linear pipeline processor, Non-linear pipeline processors, Instruction and Arithmetic pipeline design, principles of designing pipelined processors.

UNIT - 2 (12 Hours)

Structures and Algorithms for Array Processors: Introduction to SIMD Computer Organization, Interconnection networks, parallel algorithms for array processors

Associative array processing: Associative memory organization**.**

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UNIT - 3 **(12 Hours)**

Multiprocessors Architecture and Programming: Functional structures, Interconnection networks, Cache coherence and solutions, Interleaved memory organization, Multiprocessor operating systems, Language features to exploit parallelism, detection of parallelism in programs
IBM Blue Gene Supercomputer.

UNIT - 4 **(12 Hours)**

Core level parallel processing: Generalized structure of chip multiprocessors (CMP), cache coherence in CMPs, Intel Core I7 architecture. CMPs using interconnection networks: Ring interconnection of processors, Ring bus CMPs, Intel Xeon Phi Coprocessor architecture**.** General purpose graphics processing unit (GPGPU).

Recommended Readings:

1. Hwang and Briggs; Computer architecture and parallel processing; TMH, ISBN:0-07 031556-6
2. Parallel Computers – Architecture and Programming; V. Rajaraman and C. Siva Ram Murthy; PHI, 2/e
3. Nicholas Carter; Computer Architecture; TMH, ISBN: 0-07-048332-5
4. Kai Hwang; Advanced computer architecture; TMH, ISBN: 0-07-031622-8

List of Experiments in Advanced Computer Architecture:

(At least 8 experiments should be conducted from the list of experiments. A certified journal reporting the experiments conducted should be submitted at the end of the term)

Case studies(3 No.s) of various super computers and high performance computing devices.
Parallel and distributed programs using NVDIA (5 No.s)
Simulation of various pipelining techniques. (3 No,s)

IT 8.4.4 STORAGE AREA NETWORK

Subject Code	Name of the Subject	Scheme of Instruction Hrs/Week			Scheme of Examination						
					Th Duration (Hrs)	Marks					
		L	T	P		Th	S	TW	P	O	Total
IT 8.4.4	**Storage Area Network**	**3**	**1**	**2**	**3**	**100**	**25**	**-**	**-**	**25**	**150**

Course Objectives:

The subject aims to provide the student with:

1. Understand the necessity for storage area networks.
2. Understand the appropriateness of the networked storage options
3. Knowledge of the architecture of backup/recovery and virtualization

Course Outcomes:

The student after undergoing this course will be able to:

1. Explain the need for storage area networks.
2. Choose best option for given application environment
3. State architecture of backup/recovery and virtualization.

UNIT - 1 (12 Hours)

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.

Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels, JBOD, Storage virtualization using RAID and different RAID levels.

UNIT - 2 (12 Hours)

Caching: Acceleration of Hard Disk Access; Intelligent disk subsystems; Availability of disk subsystems. The Physical I/O path from the CPU to the Storage System; SCSI.

Fiber Channel Protocol Stack; Fiber Channel SAN; IP Storage. The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system.

UNIT - 3 (12 Hours)

Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fiber Channel and NAS.

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

UNIT - 4 **(12 Hours)**

Overview, creating a Network for storage; SAN Hardware devices, The fiber channel switch, Host Bus adapters; Putting the storage in SAN; Fabric operation from a Hardware perspective.

The switch's Operating system, Device Drivers, The Supporting the switch's components, Configuration options for SANs. Planning for business continuity.

Recommended Readings:

1. Ulf Troppens, Rainer Erkens and Wolfgang Muller; Storage Networks Explained; John Wiley & Sons, 2003.
2. Robert Spalding; Storage Networks: The Complete Reference; Tata McGraw Hill, 2003
3. Richard Barker and Paul Massiglia; Storage Area Network Essentials: A Complete Guide to understanding and Implementing SANs; John Wiley India, 2002
4. Marc Farley; Storage Networking Fundamentals; Cisco Press, 2005

List of Experiments in Storage Area Networks:

(At least 8 experiments should be conducted from the list of experiments. A certified journal reporting the experiments conducted should be submitted at the end of the term)

1. Case Study of a Storage Area Networks
2. Study of a NAS hardware Architecture
3. Implementing Local File System
4. Implementing a network file system
5. Implementation of storage virtual systems in a block level
6. Implementation of storage virtual systems in a file level
7. Study of Switch's operating system
8. Development of SAN application for digital library.

APPENDIX C

QUESTION PAPER PATTERN

Syllabus in each subject will have 4 units.

Question paper shall be drawn as follows:

Question No	From Units	No. of Questions to be Set	No. of Questions to be Answered	Remarks
1-3	1-2	3 x 20marks	2 x 20 marks	Each unit shall have minimum 20 marks
4-6	3-4	3 x 20 marks	2 x 20 marks	Each unit shall have minimum 20 marks
7-8	1-4	2 x 20 marks	1 x 20 marks	---
		8 - 160 marks	5 - 100 marks	

SAMPLE QUESTION PAPER

SUBJECT: MARKS: 100

MAXIMUM DURATION: 3 hours

Instructions to the candidates:

1.

2

Part –A (Questions to be drawn from units 1 & 2)

Answer any **TWO** questions from the following: 2 x 20= 40 Marks

Question-1 .....20 Marks

a)

b)

..

Question-2 .....20 Marks

a)

b)

..

Question-3 .....20 Marks

a)

b)

..

Part –B (Questions to be drawn from units 3 & 4)

Answer any **TWO** questions from the following: 2 x 20= 40 Marks

Question-4 .....20 Marks

a)

b)

..

Question-5 .....20 Marks

a)

b)

..

Question-6 .....20 Marks

a)

b)

..

Part –C (Questions to be drawn from all units i.e. units 1 - 4)

Answer any **ONE** question from the following: 1 x 20= 20 Marks

Question-7 .....20 Marks

a)

b)

..

Question-8 .....20 Marks

a)

b)

..

..