CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Scheme of Teaching & Examination

M.E. Computer Technology & Applications

I Semester

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination Theory / Practical			Total Marks	Credit L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Applied Mathematics	549111 (14)	Random Processes and Discrete Mathematics	3	1	-	100	20	20	140	4
2	Computer Science & Engg.	549112 (22)	Advanced Computer Architecture	3	1	-	100	20	20	140	4
3	Computer Science & Engg.	549113 (22)	Advanced data structure and Algorithm Analysis	3	1	-	100	20	20	140	4
4	Computer Science & Engg.	549114 (22)	High Speed Computer Network	3	1	-	100	20	20	140	4
5	Refer Table –I		Elective -I	3	1	-	100	20	20	140	4
6	Computer Science & Engg.	549121 (22)	Computer Software Lab –I	-	-	3	75	-	75	150	2
7	Computer Science & Engg.	549122 (22)	Computer Hardware Lab –I	-	-	3	75	-	75	150	2
Total				**15**	**5**	**6**	**650**	**100**	**250**	**1000**	**24**

L- Lecture T- Tutorial
P- Practical , ESE- End Semester Exam
CT- Class Test TA- Teacher's Assessment

Table-I

ELECTIVE I			
S.No.	**Board of Study**	**Subject Code**	**Subject**
1	Computer Science & Engg.	549131 (22)	Software Architecture in Practice
2	Computer Science & Engg.	549132 (22)	Internet Engineering
3	Computer Science & Engg.	549133 (22)	Advanced Digital Signal Processing

Note (1) – 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.

Note (2) – Choice of elective course once made for an examination cannot be changed in future examinations.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I** Branch: **Computer Science & Engg**
Subject: **Random Processes and Discrete Mathematics** Code: **549111 (14)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**:** 02

UNIT 1:
Random Processes
Definitions, basic concepts and examples. Continuity concepts. Classes of stochastic processes; Independent increment processes. Gaussian processes and Brownian motion. Stationarity and ergodictiy. Covariance functions and their properties. Linear operations and second order calculus. Orthogonal expansions.

UNIT 2:
Wide Sense Stationary Processes
Spectral representation – Herglotz's and Bochner's theorems. L-stochastic integrals. Decomposition of stationary processes – Spectral decomposition theorem.

UNIT 3:
Elements of Lebsegue Integration
Measurable sets and functions. Integral of simple functions, the integral of an negative measurable function, the monotone convergences theorem, Fatou's Lemma, Integrable functions, Properties of integral, The Lebesgue Dominated convergence theorem, LP-Spaces, Holder's and Minkowski's inequalities, Riez-Fischer Theorem, Product measures and the Fubini's Theorem (proof is not expected), Fourier transform of L2 functions, Plancheral's theorem, Parsval relations.

UNIT 4:
Advanced Counting Techniques, Sets and Functions
Recurrence Relations: Solving Recurrence Relations, Divided conquer Relations, Inclusion and Exclusion, Applications Set, Set operations, Functions, Sequence and Summations, The Growth of Functions.

UNIT 5:
Automata Theory and Formal Languages
Finite Automata: Basic concepts of strings, alphabets, languages, Principles of mathematical induction, finite automation, deterministic, non-deterministic and equivalence, transition diagrams, epsilon transition, equivalence of regular expressions and FA, Moore and Mealy machines. Regular languages: Pumping Lemma of regular sets, Myhill nerode theorem, Minimization of finite automata. Chomsky Hierarchy of languages. Context free languages: Relations between classes of languages, Context free grammar, Derivation trees, and ambiguity simplification.

Text Books:
R.G.BARTLE: The Elements of Integration – Wiley.
R.B.ASH & W.A. GARDNER: Topics in Stochastic Processes – Wiley.
H.STARK & J.W.WOODS: Probability and Random Processes and Estimation Theory for Engineer (2/e) – PHI.

Reference Books:
E.WONG & B.HAJEK: Stochastic Processes in Engineering Systems-Springer Verlag.
E.WONG: Introduction to Random Processes – Springer Verlag.
KENNETH H-ROSEN: Discrete Mathematics and its Applications – McGraw-Hill.
J.E.HOPCROFT & J.D.ULLMAN: Introduction to Automata Theory, Languages and Computation – Narosa.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I** Branch: **Computer Science & Engg**
Subject: **Advanced Computer Architecture** Code: **549112 (22)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

Unit 1: Parallel Computer Models

The State of Computing: Computer Development Milestones. Elements of Modern Computers. Evolution of Computer Architecture. System Attributes to Performance. Multiprocessors and Multi computers Shared Memory Multiprocessors. Distributed-Memory Multi computers. Multi vector and SIMD Computers: Vector Super computers, SIMD Supercomputers, PRAM and VLSI Models: Parallel Random-Access Machines, VLSI Complexity Model

UNIT 2: Program and Network Properties

Conditions of Parallelism: Data and Resource Dependences, Hardware and Software Parallelism, The Role of Compilers Program Partitioning and Scheduling: Grain Sizes and Latency, Grain Packing and Scheduling, Static Multiprocessor Scheduling Program Flow Mechanisms: Control flow versus data flow. Demand-Driven Mechanisms. Comparison of Flow Mechanisms

UNIT 3: Principles of Scalable Performance

Performance Metrics and Measures: Parallelism Profile in Programs. Harmonic Mean Performance. Efficiency, Utilization, and quality. Standard Performance Measures. Parallel Processing Applications: Massive Parallelism for Grand Challenges. Application Models of Parallel computers. Standard Performance Measures. Speedup Performance Laws: Amdahl's Law for a fixed workload, Gustafson's Law for Scaled Problems, Memory –Bounded Speedup Model.

UNIT 4: Processor & Memory Hierarchy

Advanced Processor Technology: Design space of processors. Instruction-Set Architectures. CISC Scalar Processors. RISC Scalar Processors Super scalar and Vector Processors: Super scalar Processors. The VLIW Architecture. Vector and Symbolic Processors.

UNIT 5: Pipelining and Super scalar Techniques.

Linear Pipeline Processors: Asynchronous and Synchronous Models. Clocking and Timing Control. Speedup, Efficiency, and Throughput Instruction Pipeline Design: Instruction Pipeline Design. Mechanisms for Instruction Pipelining. Dynamic Instruction Scheduling. Branch Handling Techniques. Arithmetic Pipeline Design: Computer Arithmetic Principles. Static Arithmetic Pipelines. Multifunctional Arithmetic Pipelines.

Text Books:

1. Advanced Computer Architecture "A design space Approach" by Dezso Sima , Terence Fountain, Peter Kacsuk Pearson Education
2. "Advanced Computer Architecture" Parallelism Scalability & Programming by Kai Hwang Mc Graw Hills International.

Reference Books:

1. The essentials of Computer Organization & Architecture by Linda Null & Julia Lobur by Narosa Publications.
2. "Computer Architecture & Organization" John P. Hayes 3 rd Edition.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I** Branch: **Computer Science & Engg**
Subject: **Advanced Data Structures & Algorithms Analysis** Code: **549113 (22)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class to be conducted**: 02**

UNIT 1: Introduction
Analysing algorithms, Growth function: Asymptotic notation, Standard notation & common functions, Recurrence relation heaps and introduction to notation &common functions, Recurrence relation heaps and introduction to 2-3 trees, Heap sort, Amortised Analysis.

UNIT 2: Dynamic Programming Paradigm
The basis dynamic programming paradigm, Viewing shortest path algorithms from that perspective, Dynamic programming solution to the optimal matrix chain multiplication and the longest common subsequence problems, Top down recursive algorithms using tables of solutions of sub problems as an alternative to bottom up general dynamic programming. Greedy Paradigm: The basic greedy strategy & computing minimum spanning trees, Algorithms of Kruskal and Prim, Use of Union Find Algorithm in implementation of Kruskal's algorithms, The relationship in Dijkstra's and Prim's algorithms, Use of greedy strategy in algorithms for the Knapsack problem and Huffman trees.

UNIT 3: Divide and Conquer Paradigm
Divide and Conquer recurrence equations and their solutions, Quick and merge sorting techniques from the perspective of their fitting into the divide and conquer paradigm, Linear time selection algorithm, The basic divide and conquer algorithm for matrix multiplication. Basic Graph Algorithms: Representational issues in graphs, Depth first search on graphs, Computation of biconnected components and strongly connected components using the depth first –search paradigm, Topological sorting of nodes of an acyclic graph. Shortest Path Algorithms on Graphs: Bellman – Ford shortest path problem, Dijkstra's algorithm & Analysis of Dijkstra's algorithm using Fibonacci heaps, Floyd-Warshall's all pairs shortest path algorithm and its refinement for computing the transitive closure of a graph.

UNIT 4: String Matching Algorithms
Modelling the general string problems finite automata, Motivation of the failure function in the Knuth Morris and Pratt Paradigm, Linear time analysis of the KMP algorithm, The Boyer-Moore refinement of the KMP algorithm, computation of the failure functions for the Boyer-Moore algorithm.

UNIT 5: NP-Complete Problems
Examples of problems like traveling salesman tour for which enumeration and back tracking seems to be the only method of finding the optimal solution, notion of a non deterministic algorithm and its basic relationship to back tracing. The notion of a polynomial time non-deterministic algorithm, Polynomial time non-deterministic algorithms for problems like satisfiability, clique problem, Hamiltonian path problems etc. The definition of NP-hardness and NP-completeness, The statement of Cook's theorem and a discussion of its implications, The notion of polynomial transformation and reductions, Reductions to show that the clique problem, vertex cover, subset sum and Hamiltonian cycle problems are NP-complete.

Text Books
Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, and Ronald L. Rivest, MIT Press and McGraw Hill.
The Design and Analysis of Computer Algorithms, Alfred V. Aho, John E. Hopcroft and Jeffrey D.Ullman, Addison Wesley.

Reference Books:
Fundamentals of Computer Algorithms, Ellis Horowitz and Satarj Shani, Computer Science Press
Introduction to Algorithms: A Creative Approach, Udi Manber Addision Wesley.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I** Branch: **Computer Science & Engg.**
Subject: **High Speed Computer Network** Code: **549114 (22)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class to be conducted**: 02**

Unit 1: Introduction
Computer network design requirements, Network architecture, Implementing network software, Performance. Direct Link Networks: Hardware building blocks, Encoding, Framing, Error detection, Reliable transmission, Ethernet (802.3), Token Rings (802.5, FDDI), Wireless (802.11).

UNIT 2: Packet Switching
Switching and Forwarding, Bridges and LAN switches, Cell switching (ATM), Implementation and performance.Internetworking: Simple internetworking (IP), Routing, Global Internet, Multicast, Multiprotocol Label Switching (MPLS).

UNIT 3: End-to-End Protocols
Simple Demultiplexer (UDP), Reliable Byte Stream (TCP). Congestion Control and Resource Allocation: Issues in resource allocation, Queuing disciplines, TCP congestion control, Congestion-avoidance mechanisms, Quality of Service.

UNIT 4: Applications
Name Service (DNS), Electronic Mail, World Wide Web, Real-time Transport Protocol, Session control and call control, Overlay networks.

UNIT 5: Network Management
Network monitoring and control, SNMP –V1, V2 & V3, RMON and RMONV2.

Text Books
Larry L. Peterson & Bruce S. Davie, Computer Networks – A Systems Approach, Morgan Kaufmann Publishers, 3rd Edition, 2003.
William Stallings, SNMP, SNMPV2, SNMPV3, RMON1 and 2, Addison Wesley, 3rd Edition, 1999.

Reference Books
Mani Subramanian, Network Management: Principles and Practice, Addison Wesley, 2000.
James F. Kurose and Keith W. Ross, Computer Networking – A Top-down approach featuring the Internet, Addison Wesley, 3rd Edition, 2004.
S. Keshav, An Engineering approach to Computer Networks, Addison Wesley, 1997.
R. Perlman, Interconnections – Bridges, Routers, Switches, and Internetworking Protocols, 2nd Edition, Addison Wesley, 2000.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Subject: **Software Architecture in practice**
Total Theory Periods: 40
Total Marks in End Semester Exam. : **100**
Minimum number of class to be conducted**: 02**

Branch: **Computer Science & Engg.**
Code: **549131 (22)**
Total Tutorial Periods: **12**

UNIT1: Software Requirement Analysis
Defining scope and other products, time, cost and resource estimation, Technical assessment, cost benefit analysis, Cash flow forecasting, Break even analysis, Risk evaluation.
S/w development life cycle, process model, waterfall model, spiral model, prototyping, roll of matrix & measurement, s/w requirement specification, problem analysis, validation, matrices, monitoring and control.

UNIT 2: Software Design
Problem partitioning, problems in S/w estimation, Effort estimation techniques, Delphi technique, Algorithmic methods, function point analysis, COCOMO Model. Top-down & Bottom-up design, structured approach, functional verses object oriented approach, design specification & verification matrix.

UNIT 3: Coding Technique
Top-down & Bottom-up approach, structured programming, information hiding, programming style, internal documentation and verification.

UNIT 4: Testing & Maintenance
Level of testing, functional testing, structural testing, white box & black box approach, reliability assessment, s/w maintenance & different approach for s/w maintenance.

UNIT 5: S/W Project Management & Quality Assurance
S/W configuration management, base line project scheduling, last estimation, quality assurance, project monitoring, risk management. Quality Standards: ISO 2000, CMM, quality audit, Configuration

Text Books

1. Len Brass, Paul Clements “Software Architecture in Practice”, (Pearson)
2. Pressman R. “Software engineering A Practitioner’s Approach”, (TMH)

Reference Books

1. Jalote Pankaj,”Integrated Approach TO Software Engineering”, Nasola
2. Rumbaugh J., Blaha, M. Premeralani, W. Eddy F. And Lorensen W. “Object Oriented Modelling & Design”,(PHI)
3. Quality S/w Project Management, Schufer, LPE
4. S/w Project Management, Hughesff cotterel, TM

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Subject: **Internet Engineering**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class to be conducted**: 02**

Branch: **Computer Science & Engg.**
Code: **549132 (22)**
Total Tutorial Periods: **12**

UNIT 1:Introduction
Internet Services, History and scope, Internet protocols and standardization, Ethernet technology, Fiber distributed data interface, synchronous transfer mode, ARPANET technology, ANSNET Application level Interconnection Networks, Internet Architecture – Interconnection through IP routers, Three primary class of IP addresses and relevant properties, Resolution through direct mapping.

UNIT 2:Address Resolution Protocol
ARP refinements and Implementation, ARP encapsulation and identification, ARP protocol format, Reverse address resolution protocol Timing RARP transactions, Primary and Backup RARP servers.
Subnet and Supernet Extensions: Proxy ARP – Subnet addressing, Flexibility in subnet address assignment, Implementation of subnet with masks, subject mask representation, Routing in the presence of subnet – subnet routing algorithm, A unified routing algorithm, maintenance of subnet masks, Broadcasting to subnets-Supernet addressing, the effect of superneting or routing.

UNIT 3: Java Features
Java features – Differences between Java, C and C++ - Java and Internet, Web browsers, Java Environment, Programme structure, Tokens, Statements, Java virtual machine, Command line arguments, Variables, constants and data types, operators & expressions, decision making and branching classes, objects and methods, arrays, strings and vectors.

UNIT 4:
Multiple Inheritance, Packages, multi threaded programming, errors and exceptions, applet programming, graphics programming and problems in JAVA.

UNIT 5:HTML
HTML: Concepts of tags, layout – comments, paragraphs, aligning, line break, style tags, address, links, formatting, relative and absolute path, images-Graphical link to images, CGI, Introduction to JavaScript & Perl. Overview of E-Commerce and Internet security.

Text Books
1. COMER DE & STEVANS DL: Internet working with TCP/IP Vol I, 3rd Edition, PHI, 1998.
2. E.BALAGURUSWAMY: Programming with Java Printer, TMH, 1999, 2nd Edition.

Reference Books
1. JOHN R.HABBARD: Programming with Java, Schaum's outline series McGraw Hill, 1999..

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**
Subject: **Advanced Digital Signal Processing**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class to be conducted: **02**

Branch: **Computer Science & Engg.**
Code: **549133 (22)**
Total Tutorial Periods: **12**

UNIT-1 DISCRETE RANDOM SIGNAL PROCESSING

Discrete random processes, Expectation, Variance, Co-Variance, Scalar product, Energy of Discrete Signals - Parseval's Theorem, Weiner Khitchine relation - Power spectral density - Periodogram - Sample auto-correlation - Sum Decomposition Theorem, Spectral Factorization Theorem - Discrete random signal processing by linear systems - Simulation of white noise - Lowpass filtering of white noise.

UNIT-2 SPECTRUM ESTIMATION

Non-Parametric methods - Correlation method - Co-variance estimator - Performance analysis of estimators – Unbiased consistent estimators - Periodogram estimator - Barlett spectrum estimation - Welch estimation - Model based approach - AR, MA, ARMA Signal modeling - Parameter estimation using Yule-Walker method.

UNIT-3 LINEAR ESTIMATION AND PREDICTION

Maximum likelihood criterion - Efficiency of estimator - Least mean squared error criterion - Wiener filter - Discrete Wiener Hoff equations - Recursive estimators - Kalman filter - Linear prediction, Prediction error - Whitening filter, Inverse filter - Levinson recursion, Lattice realization, Levinson recursion algorithm for solving Toeplitz system of equations.

UNIT-4 ADAPTIVE FILTERS

FIR Adaptive filters - Newton's steepest descent method - Adaptive filters based on steepest descent method - Widrow Hoff LMS Adaptive algorithm - Adaptive channel equalization - Adaptive echo canceller - Adaptive noise cancellation - RLS Adaptive filters - Exponentially weighted RLS - Sliding window RLS - Simplified IIR LMS Adaptive filter.

UNIT-5 MULTIRATE DIGITAL SIGNAL PROCESSING

Mathematical description of change of sampling rate - Interpolation and Decimation - Continuous time model - Direct digital domain approach - Decimation by integer factor - Interpolation by an integer factor - Single and multistage realization - Poly phase realization - Applications to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

TEXT BOOKS

1. Monson H. Hayer, “Statistical Digital Signal Processing and Modeling”, John Wiley and Sons Inc., New York, 1996.

REFERENCE BOOKS

1. Sophoncles J. Orfanidis, “ Optimum Signal Processing “, McGraw-Hill, 1990.
2. John G. Proakis, Dimitris G. Manolakis, “Digital Signal Processing”, Prentice Hall of India, New Delhi, 1995.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I** Branch: **Computer Science & Engg.**
Subject: **Computer Software Lab – I** Code: **549121 (22)**
Total Marks in End Semester Exam. : **75** Total Lab Periods: **40**

List of Experiments (to be performed at least 10 experiments)

1. Write a program to sort a given list of numbers by using heap sort and find the complexity of heap sort.
2. Write a program for N-Queen Problem by using backtracking.
3. Write a Program to implement Knapsack Problem and find the complexity of the problem.
4. Write a program to traverse a graph by using DFS and BFS technique and find the complexity of the techniques.
5. Write a program to find the largest common subsequence for the given graph.
6. Write a program to find the shortest path for each pair of source and destination by using Dijkstra's Algorithm.
7. Write a Program to communicate from one PC to another PC by using Sockets.
8. Simulate ALOHA protocol of Random access Method.
9. Simulate Ethernet protocol of Random access Method.
10. Simulate Token Bus protocol of Controlled Access Method.
11. Simulate Token Ring Protocol of Controlled Access Method.
12. Simulate Wireless LAN Protocol (802.11 b).
13. Simulation of X.25.
14. Simulate the TCP Protocols.
15. Simulate the UDP Protocol.

List of equipments:
1: Pentium computer with latest configuration, like Pentium IV having 256 MB RAM and appropriate backup memory system.

2: Network simulation software like Netsim, NS-2 etc.
Capable for designing, simulation and analysis.

Recommended books: "Computer Network simulation manual.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I** Branch: **Computer Science & Engg.**
Subject: **Computer Hardware Lab – I** Code: **549122 (22)**
Total Marks in End Semester Exam. : **75** Total Lab Periods: **40**

List of Experiments (to be performed at least 10 experiments)

1 Getting start with Active HDL system and become familiar with computing environment. Details of different of ICONS available on system.
2 Take any example to practice on Preparing a project using Active HDL.
3 Take example project file from HDL for simulation of a project using Active HDL.
4 Take an example of combinational circuit (for a two bit adder) and repeat above four experiments.
5 Give electronic simulation of 4-bit sub tractor.
6 Create a project on system taking simple combinational circuit and perform all steps of simulation. Also try to add your design as a library component into system.
7 Simulate following systems and observe behavior..
JK flop flop, RS flip flop, T flip flop.
8 Design and simulate a four bit Accumulator with set of control signals like READ and WRITE.
9 Take example of four-bit parallel adder to get clear understanding of Data Unit designing and Control Unit design.
10 Simulate Data Unit design of experiment no. 9
11 Simulate Control Logic for four bit parallel adder and complete simulation as per the design of experiment number 9.
12 Design a multiplier for four bit binary number using any technique. Add both the part of design Viz data unit as well as Control unit.
13 Design a divisor for four bit binary number using any technique. Add both the part of design Viz data unit as well as Control unit.
14 Design and simulate hardware of logical unit, which performs comparison of two four-bit numbers. Complete your design as per practical system.
15 Work on a project based on electronic simulation of circuit from general computing systems.

List of equipments:

1: Pentium computer with latest configuration , like Pentium IV having 256 MB RAM and appropriate backup memory system.

2: Electronic simulation software like OrCAD , Multi SIM, VHDL/ Active HDL etc. Capable for designing, simulation and analysis.

Recommended books: Avtive HDL reference ma