Pt. Ravishankar Shukla University, Raipur
S.o.S. in Computer Science & IT

Syllabus of Entrance Exam for
M. Phil. – COMPUTER SCIENCE

Digital Logic: Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point),

Computer Organization and Architecture: Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage, K-Map.

Programming languages: Programmking in C: elements of C-Tokens, identifiers , data types in C. Control structure in C. sequence, selection & iteration(s). structured data types in C-arrays, struct , union, string, and pointers.
O-O Programming Concepts: Class ,object , instantiation, Inheritance, polymorphism and overloading.
C++ Programming: Elements of C++-Tokens,identifiers. Variables and constants, data types, operators, control statements. Functions parameter passing. Class and objects. Constructors and destructors. Overloading, inheritance, templates, exception handling.

Data Structures: Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps, Graph theory. Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching.

Theory of Computation: Regular languages and finite automata, Context free languages and Push-down automata, Recursively enumerable sets and Turing machines, Undecidability.

Operating System: Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Belady's anomaly ,Memory management and virtual memory, File systems, I/O systems, Protection and security.

Databases: ER-model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normal forms), Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.

Information Systems and Software Engineering: information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.

Computer Networks: ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques (error correcting & detecting,CRC), Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http); Basic concepts of hubs, switches, gateways, and routers. Network security - basic concepts of public key and private key cryptography, digital signature, firewalls.

Mobile communication: Introduction, Cellular system infrastructure, Registration, Handoff Parameters and Underlying support, Roaming Support Using Backbone to Mobile IP, Functions of Mobile IP, Mobile Node, Corresponding Node, Home Network, Foreign network, Home agent, Foreign Agent, care of Address, IP Packet Delivery, Agent Delivery, Agent Solicitation, Registration, Tunneling, Dynamic Host configuration protocol.

2018-2019

Scheme of M. Phil. (Computer Science & IT)

S. No.	Paper	Name of Papers	Marks
Semester - I			
I.	Paper - I	Research Methodology and Communication System	100
II.	Paper - II	**Electives :**	100
		1. Parallel Computing	
		2. Data Mining and Data Warehousing	
III.	Paper - III	Practical Based on Paper - I & II	100
		Total Marks	**300**
Semester - II			
I.	Seminar	Based on Theory	50
II.	Dissertation	Seminar based on Dissertation	50
		Script Writing	150
		Viva-Voc	50
		Total Marks	**300**
		GRAND TOTAL	**600**

Note :- In order to pass the M. Phil. examination a candidate will be required to obtain a minimum of 50% of marks both in the aggregate of theory, practical, seminars and dissertation, separately.

PAPER - I
Research Methodology and Communication System

Unit-I

Research Methodology - An Introduction; Meaning, Motivation, Type, Approaches, Significance, Research and Scientific method of Research, Research Process, Criteria of Good Research; **Research Problem** - selecting the research Problem, Techniques involved in defining problems, **Research Design** - need, features, important concepts relating to research design, different research design.

Unit-II

Sampling Design - Sample Survey, Implications, steps, criteria of selection, characteristics, types. **Measurements** - Measurement in Research, Sources of Errors, Techniques of developing Measurement Tools, Scaling, Scale Classification Bases; **Methods of Data Collection** - Collection of Primary Data, Collection of Secondary Data; **Processing and Analysis** - Processing Operations, Some Problems, Types of Analysis.

Unit-III

Hypothesis - Basic Concepts, Procedure for Hypothesis Testing, Flow Diagram, Tests of Hypothesis, Important Parametric Tests, Hypothesis Testing of Means, Difference between means, Comparing Two related samples, Hypothesis Testing of Proportions, Difference between Proportions, Comparing a variance to some, Hypothesis Testing of Correlation Coefficient, Limitation of Test of Hypothesis.

Unit-IV

Wireless Communication - Introduction, Cellular Sys1tem Infrastructure, Registration, Handoff Parameters and Underlying support, Roaming Support Using System Backbone, Functions of Mobile IP, Mobile Node, Corresponding Node, Home Network, Foreign Network, Care-of Address, Introduction to IEEE 802.11, Security threats to Wireless Networks, **Current approaches** - Wireless Networks Security, Social Networking and Blogs.

Unit-V

Mobile Adhoc Network - Introduction to Mobile Adhoc Network(MANET), Characteristics of MANET, Applications of MANET, Routing, Need for Routing, Routing Classification, Table-Driven Routing Protocol – Destination Sequenced Distance Vector Routing Protocol, Cluster-Head Gateway Switch Routing, Wireless Routing Protocol. Source initiated On-demand Routing- Adhoc On Demand Distance Vector Routing, Dynamic Source Routing, Temporarily Ordered Routing Algorithms, Hybrid Protocol – Zone Routing Protocol. Current issues and perspectives. Introduction to Network Simulators.

References/Books

1. Research Methodology C.R Kothari, New Age international Publishers
2. Computer Network by A.S. Tanenbaum, Pearson Education.
3. Data Communications and Networking by B.A. Forouzan, TMH.
4. Introduction to Wireless and Mobile Systems: D.P. Agrawal , Qing-An Zing , Vikas Publishing House.

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PAPER - II
Elective - 1 : Parallel Computing

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Unit-I

Introduction– Transistors and its applications. Types of parallelism, architectural classification schemes, tightly and loosely coupled architectures, memory models, parallel computers and its types. To achieve parallelism in uniprocessor machine. DOP, Bernstein' conditions. Solving mismatch problem between software parallelism and hardware parallelism.

Unit-II

Pipelining – Types of pipelines, Hazard detection and resolution, Job sequencing and collision prevention, calculation of MAL, bounds on MAL. Implementation with shift register. Arithmetic pipeline Design using CSA & CPA.

Unit-III

Interconnection Networks- Static and dynamic, Hypercube interconnection network, multistage interconnection networks- types, architecture & routing, design consideration, performance evaluation and fault tolerance of interconnection networks. Benchmarks, Grains.

Unit-IV

Advanced processor Technology and Case Studies - Brief overview of processors. RISC, CISC, VLIW, super scalar architecture, Vector computer-vector operation, vector chaining. Functional organization of instruction in IBM 360/91, architectures of different versions of Cray and PARAM, sequent symmetry computer.

Unit-V

Exploiting parallelism in programs- Multidimensional arrays, DAG, distance and direction vectors, data flow computers and data flow graphs.
Parallel Algorithm- Matrix addition, subtraction, multiplication-block and SIMD, sorting- Bitonic sort, sorting on linear array processors.
Overview of OMP, MPI and CUDA.

Text Books:
1. Computer Architecture & Parallel Processing by Kai Hwang and F.A. Briggs-Mc Graw Hill.
2. Advanced Computer Architecture By Kai Hwang –Mc Graw Hill.
3. Parallel Computer Architecture & Programming by- V Raja Raman and C. Shiarammuty-PHI

Reference Books:
Parallel Computing Theory and practice by Michael J. Quinn –Tata Mc-Graw Hill.

Elective - 2 : Data Mining & Data Warehousing

Unit-I

Introduction & Data Warehousing and OLAP Technology for Data Mining – What is data mining?, Data Mining: On what kind of data?, Data mining functionality, Are all the patterns interesting?, Classification of data mining systems, What is a data warehouse?, A multi-dimensional data model, Data warehouse architecture, Data warehouse implementation, Further development of data cube technology, From data warehousing to data mining. Concept of Transaction, Transactional database, Distributed Database, Commit Protocols.

Unit-II

Data Preprocessing, Data Mining Primitive, Languages and System Architecture –
Why preprocess the data?, Data cleaning ,Data integration and transformation, Data reduction, Discrimination and concept hierarchy generation, Data Mining Primitive, Data Mining Query Language, Architecture of data mining system.

Unit-III

Mining Association Rules in Large Databases-
Association rule mining, Mining single-dimensional Boolean association rules from transactional databases, Mining multilevel association rules from transactional databases, Mining multidimensional association rules from transactional databases and data warehouse, From association mining to correlation analysis, Constraint-based association mining.

Unit-IV

Classification and Prediction & Cluster Analysis –
What is classification? What is prediction? Issues regarding classification and prediction, Classification by decision tree induction, Bayesian Classification, Classification by back propagation, Classification based on concepts from association rule mining, Other Classification Methods ,Prediction, Classification accuracy, What is Cluster Analysis?, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

Unit-V

Mining Complex Types of Data & Applications and Trends in Data Mining -Multidimensional analysis and descriptive mining of complex data objects, Mining spatial databases, Mining multimedia databases, Mining time-series and sequence data, Mining text databases, Mining the World-Wide Web, Data mining applications, Data mining system products and research prototypes, Additional themes on data mining, Social impact of data mining, Trends in data mining.

BOOKS RECOMMENDED

1. Data Mining: Concepts and Techniques   - Jiawei Han and Micheline Kamber
2. Data Mining Concepts   - H. Marget