

Time : 3Hrs.

**Ph.D. COMPUTER SCIENCE**  
**Ph.D. 101: RESEARCH METHODOLOGY**

Theory Paper : Max. Marks 80  
Internal Assessment : Max Marks 20  
Minimum Pass Marks : 55

The paper setter is required to set in all Eight questions, out of which only four question are to be attempted by the students. All questions will be of equal marks. Two questions are to be set from each unit. The students are required to attempt at least one questions from each unit.

Unit- I

**Introduction to Computer Science Research:** What is Research, Types of Research, Why Research, and Significance & Status of Research in Computer Science. Steps in Research: Having grounding in Computer Science, Major Journals & Publication in Computer Science, Major Research areas of Computer Science, Identification, selection & Formulation of research problem, Hypothesis formulation, Developing a research proposal, Planning your research, The wider community, Resources and Tools, How engineering research differs from scientific research, The role of empirical studies.

Unit-II

**Qualitative Reasoning:** Qualitative Representations, Representing Quantity, Representing Mathematical Relationship, Ontology, State, Time and Behaviours, Space and Shape, Compositional Modelling, Domain Theories, and Modelling Assumptions, Qualitative Reasoning Techniques, Model Formulation, Causal Reasoning, Simulation, Comparative Analysis, Teleological Reasoning, Data Interpretation, Planning, Spatial Reasoning, Applications of Qualitative Physics. **Simulation:** What is simulation? How a simulation model works, Time and randomness in simulations, Applications of simulation.

Unit- III

**Literature Survey:** Finding out about your research area, Literature search strategy, Writing critical reviews, Identifying venues for publishing your research, **Research Data:** What is data, Mathematical statistics and computer science views on data analysis, Methods for finding associations: regression and pattern recognition, Method for aggregation and visualization: principal components and clustering, Hypothesis testing.

Unit- IV

**Basis of Computer Science Research:** Introduction to Formal Models and Computability: Turing Machine & Computability, Undecidability, Diagonalization and Self-Reference, Reductions. **Thesis Writing:** Planning the thesis, Writing the thesis, Thesis structure, Writing up schedule, The Oral examination and Viva Voce. **Writing Papers and the Review Process:** Preparing and presenting your paper. The conference review process, Making use of the referees' reports, The journal review process, Group exercise in reviewing research papers.

**Text Books/REFERENCES:**

1. **Research Methods** By Francis C. Dane, Brooks/ Cole Publishing Company, California.
2. **Basic of Qualitative Research (3<sup>rd</sup> Edition)** By Juliet Corbin & Anselm Strauss, Sage Publications (2008).
3. **The Nature of Research: Inquiry in Academic Context** By Angela Brew, Routledge Falmer (2001).
4. **Research Methods** By Ram Ahuja, Rawat Publications (2001).
5. **The Computer Science and Engineering Handbook** by (Editor-in-Chief) By Allen B. Tucker, jr. CRC Press, A CRC Handbook Published in co-operation with A (only relevant parts of chapters of Chapter-2, Chapter-3, Chapter-4 Chapter-9, Chapter-10 & Chapter-32).

**Ph.D. COMPUTER SCIENCE**  
**Ph.D. 103: COMPUTER APPLICATION**

Time : 3Hrs.

Theory Paper	: Max. Marks	80
Internal Assessment	: Max Marks	20
Min Pass Marks	:	55

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**Unit I**      **Overview Of Programming Languages**, Brief History, Programming Paradigms And Application Domain, Programming Qualities, **Imperative Language** : Principes, Naming Variables, Elements, Types, Values And Expression, Syntax And Semantics Of Jay Statements, Syntax And Semantics Of Statements In Real Languages, Scope Visibility And Life Time , Examples Of Imperative Lanuages.

**Unit II**      **Object Oriented Languages** : Principles, Classes, Inheritance, Class , Hierarchies, Polymorphism, Dynamic Binding , Reference Semantics And Thier Implementation, Abstract, Class, Interface. **Functional Languages** : Principles, Functions, Lists, Types And Polymorphism, High Order Function, Lazy Evaluation, Equation And Pattern Matching.

**Unit III**      **Logic Programming** : Logic Predicate And Horn Clauss, Prolog : Fact, Variables And Queries, Lists, Practical Aspects Of Prolog, Prolog Applications , **Event Driven Programming** : The Event Model Event Driven Programming Paradigm, Applets, Event Handling, Example Of A Simple Guiinterface And Interactive Games other Programming.

**Unit IV**      **Concurrent Programming** : Concepts, Communication and Synchronization, Deadlock and Unfairness, Semaphores, Monitors, Javathreads, Synchronization In Java, Example Of Bouncing Ball. **Exception Handling** : Traditional Techniques, Model and Exceptions In Jav, Some Examples.

**Text Books/REFERENCES:**

1. Programming Language Principal And Paradigms By Allentucker And Robert Noonam, Tata McGraw Hill Edition.
2. Concept Of Programming Languages, 4th Editio, Robert W. Seesta, Addison-Wesley, 1999



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**Unit I** Data Warehousing Introduction –Definition-Architecture-Warehouse Schema-Warehouse server-OLAP operations. Data Warehouse technology –Hardware and operating system-Warehousing Software –Extraction tools –Transformation tools –Data quality tools –Data loaders –Data Access and retrieval tools –Data Modeling tools –Fact tables and dimensions Data warehousing case studies : Data warehousing in Government , Tourism, Industry , Genomics data.

**Unit II** Data Mining definition –DM Techniques –current trends in data mining -Different forms of Knowledge –Data selection, cleaning, Integration, Transformation, Reduction and Enrichment. Data: Types of data -Data Quality -Data Preprocessing -Measures of similarity and dissimilarity. Exploration: Summary statistics –Visualization.

**Unit III** Association rules: Introduction –Methods to discover association rule –Apriori algorithm Partition Algorithm –Pincher search algorithm –Dynamic Item set algorithm –FP Tree growth algorithm. Classification: Decision Tree classification –Bayesian Classification –Classification by Back Propagation.

**Unit IV** Clustering Techniques: Introduction –Clustering Paradigms –Partitioning Algorithms –K means & K Mediod algorithms –CLARA –CLARANS –Hierarchical clustering –DBSCAN –BIRCH –Categorical Clustering algorithms –STIRR –ROCK –CACTUS. Introduction to machine learning –Supervised learning –Unsupervised learning –Machine learning and data mining. Neural Networks: Introduction –Use of NN –Working of NN Genetic Algorithm: Introduction –Working of GA.

**Unit V** Web Mining: Introduction ,Web content mining ,Web structure mining ,Web usage mining ,Text mining ,Text clustering, Temporal mining, Spatial mining ,Visual data mining, Knowledge mining, Various tools and techniques for implementation using (Weka / R / Matlab).

**Text Books/ References:**

1. Paulraj Ponniah, "Data Warehousing Fundamentals", John Wile.
2. M. H. Dunham, "Data Mining Introductory and Advanced Topics", Pearson Education.
3. Han, Kamber, "Dta Mining Concepts and Techniques", Morgan Kaufmann.
4. Ralph Kimball, "The Data Warehouse Lifecycle toolkit", John Wiley.
5. M Berry and G. Linoff, "Mastering Data Mining", John Willey.