Dept of Advanced Computing
PhD Entrance Examination-23 Syllabus

Units	Syllabus Details
Unit-1 Database Management Systems	• **Database System Concepts and Architecture:** Schemas, Data Models and Instances; Three-Schema Architecture and Data Independence. • **Data Modeling:** Relational Model - Constraints, Entity-Relationship Diagram, Design, Languages, and Programming. • **SQL:** Data Definition and Data Types; Queries, Constraints, Delete, Insert and Update Statements. • **Normalization for Relational Databases:** Normalization; Algorithms for Query Processing & Optimization and Functional Dependencies. • **Data Warehousing and Data Mining:** Concept Hierarchy, Data Modeling for Data Warehouses, OLAP and OLTP. • **Big Data Systems:** Introduction to Map-Reduce, Big Data Characteristics, Types of Big Data, Big Data Architecture and Hadoop.
Unit-2 Machine Learning	• **Introduction to Machine Learning (ML) -** Essential concepts of ML – Types of learning –Machine learning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends in Machine learning – Data Understanding Representation and visualization. • **Machine Learning Methods-** Linear methods – Regression - Classification –Perceptron and Neural networks – Decision trees – Support vector machines – Probabilistic models —Unsupervised learning – Featurization • **Machine Learning for Predictive Data Analytics –** Data to Insights to Decisions – Data Exploration – Information based Learning – Similarity based learning – Probability based learning – Error based learning – Evaluation – The art of Machine learning to Predictive Data Analytics.

Unit-3 Artificial Intelligence (AI)	• **Approaches to AI:** State Space Representation of Problems; Turing Test and Rational Agent Approaches. • **Knowledge Representation:** Frames, Logic, Semantic Networks, Scripts, Rules, Conceptual Dependency and Ontologies. • **Multi-Agent Systems:** Agents and Objects; Generic Structure of Multiagent System; Agents and Expert Systems. • **Fuzzy Sets:** Membership Functions, Notion of Fuzziness, Fuzzification and Defuzzification; Operations on Fuzzy Sets. • **Artificial Neural Networks (ANN):** Unsupervised, Supervised and Reinforcement Learning; Single Perceptron.
Unit-4 Computer System Architecture	• **Digital Logic Circuits and Components:** Digital Computers, Logic Gates, Map Simplifications, Boolean Algebra, Combinational Circuits. • **Data Representation:** Number Systems and Conversion, Data Types, Complements, Fixed Point Representation. • **Register Transfer and Micro operations:** Bus, Register Transfer Language and Memory Transfers. • **Basic Computer Organization and Design:** Stored Program Organization and Computer Registers, Instruction Codes, Computer Instructions. • **Programming the Basic Computer:** Assembly Language, Machine Language, Assembler.
Unit-5 Statistics	• **Measure of Central Tendency** - Mean, Median, Mode - Dispersion Technique - Range Inter Quartile Range - Variance, Standard Deviation - Mean Square Error & Root Mean Square – Probability Distribution. • **Basic Statistics** - Frequency table, histogram, measures of location, measures of spread, skewness, curtosis, percentiles, box plot, relative frequency distribution as a statistics model • **Correlation And Regression**- Covariance, Correlation coefficient, properties of Correlation coefficient, Rank correlation, linear regression (two variables), Multiple correlation and partial correlation.