DEPARTMENT OF COMPUTER SCIENCE
ALAGAPPA UNIVERSITY, KARAIKUDI 630 003

SYLLABUS FOR
Ph.D. PRE-REGISTRATION QUALIFYING ENTRANCE EXAMINATION IN COMPUTER SCIENCE

UNIT I:

Computer Architecture : Number Systems : Binary, Octal, Decimal and Hexadecimal number systems – Conversions – Complements - Fundamental concepts of Boolean Algebra – Simplification of expressions – Combinational Circuit Design – Sequential Circuit Design – Hardwired and Micro programmed processor design – Memory organization – General Register organization – Stack organization – Instruction formats – Addressing modes – Data transfer and manipulation – Program control – Interfacing peripheral devices – Interrupts.

Programming Languages: Algorithm – flowchart – C Language – Control Statements – Functions – Structures – union and files – pointers in C – C programming covering all aspects. Object oriented programming concepts – Classes and objects – Instantiation – Overloading – Inheritance – Polymorphism. Object oriented programming and features in C++ and Java programming.

Data Structures: Simple and abstract data types and data structures stacks – queues – linked list – trees balanced trees – Graphs – classes and objects – complexity of algorithms – divide and conquer – greedy – dynamic programming searching and traversal techniques – backtracking – Branch & Bound – NP Hard and NP complete problems.

UNIT II:

Operating Systems: Structures – Types – Functions – system calls – Process – CPU scheduling – Process synchronization – deadlocks – memory management – file system interface I/o systems assembles. Distributed systems communication – synchronization – deadlocks – file systems – shared memory. Unix Utilities – Problem solving approaches in Unix – Unix Internals – Unix process – Threads and signals and Inter Process Communication.

Software Engineering: Software characteristics, quality factors, Software development phases – Process models: Waterfall, Incremental, spiral, RAD models - The Unified process. Software requirement analysis – Software requirement specification document - Software Design concepts and models – design process – Object oriented design process – User Interface design process – Software testing strategies – White box and block box methods – Testing methods: Unit, Integration, and System Validation.

Graphics and Image processing : Raster Scan Graphics – 2D & 3D Transformations – Viewing – Projection Variable surface detection – Shading – Animation. Digital Image processing fundamentals – Transforms – Restoration – Image enhancement techniques– Image Segmentation – Image Compression – Morphological Image processing.

Internet of Things (IoT) : Hardware - SoC - sensors - device drivers - IoT standards - NFC, RFID, Zigbee - IoT reference Model - IoT Strategic Research and Innovation Directions - IoT Applications - Future Internet Technologies

UNIT III:

Fundamentals of Computer Networks : Computer Networks - Applications – Line configuration - Topology - Transmission Modes – Types of Networks – Network reference models: OSI/ISO, TCP - – Transmission media – Wireless transmission - Telephone networks – local, trunks, multiplexing, ISDN – ATM – Data Link Layer – Error detection and correction – Flow and error control – Sliding Window Protocol – Stop – wait protocol - Multiple Access Protocols: ALOHA – CSMA – CSMA/CD – CSMA/CA – Network Layer – Switching concept – routing – congestion control – IP – ICMP – Transport Layer – Services and Applications – UDP – TCP – FTP – SNMP.

Network Security: Fundamentals of Network security – Security attacks – Services and Mechanisms - Symmetric and Asymmetric key cryptography – Digital signatures – Web and mail security.

Mobile Communications: Medium Access Control – SDMA – FDMA – TDMA – CDMA – Tele communications GSM – Broadcast Systems Overview – Digital Audio Broadcasting – Digital Video Broadcasting. Wireless communications: Bluetooth – Wireless ATM Working Group– Services – Reference Model – Functions – Radio Access Layer – Handover – Location Management –Access Point Control Protocol

Cloud Computing : Developing Cloud Services – Fundamentals of Cloud Services - Cloud Storage Providers- Types of Clouds - Service Oriented Architecture and the Cloud – Managing the Cloud Environment – Managing and Securing Cloud Services - Cloud Security Challenges and Risks - Cloud Virtualization.

UNIT IV:

Introduction to Compilers: Compiler Structure – Compiler construction phases – Lexical analysis – Regular expressions and regular languages – Deterministic Finite State Automata – Non deterministic Finite State Automata – Grammars and languages – Context free grammars – parsing and parse trees – Bottom up parsers: Shift reduce, operator precedence and LR – Top down Parsers: Recursive descent parser – Predictive parser – Intermediate code generation – Code generation and optimization.

AI and Expert Systems : Automated Reasoning with propositional logic and Predicate logic. Inference theory and Predicate Calculus. State space representation of problems – bounding functions – breadth first – depth first – A, A*, AO* etc. – Performance comparison of various search techniques. Frames – scripts – Semantic nets – Production systems – Procedural representations – Prolog programming. Components of an expert system – Knowledge representation and Acquisition techniques – Building expert system.

Neural Networks and Fuzzy Systems : Perception model – Linear separability and XOR problem – two and three layered neural nets – Back propagation – Convergence – Hopfield nets – Neural net learning – Applications. Definition of a Fuzzy set – Fuzzy relations – Fuzzy functions – Measures – Reasoning – Applications of Fuzzy systems.

Discrete Structures: Sets, Relations, Functions - Pigeonhole Principle- Finite Automata - Pushdown Automata - Non-Deterministic Automata – Languages – Grammars -Graphs - Groups.

UNIT V

Database Management Systems: Database System – Data views – Data independence – Data Abstraction – Data Models – ER Model – Relational Model – Database languages : DDL – DML – Database Administrator – Database System Structure – ER diagram – Normalization – SQL Basics – operators and queries – Nested Queries – Commands. Query optimization and evaluation Database design – Concurrency control and recovery – Storing and Indexing Distributed data base design – Distributed Transaction Management – Reliability.

Data mining and warehousing :Data mining concepts – Functionalities, Classification of Data Mining Systems – Major Issues on Data mining – Data mining Query language – Association Rules in large Data mining – KDD Process – Classification and Prediction – Information retrieval – Dimensional Modeling of Data – Pattern Matching – Clustering Issues – impacts and approaches – Clustering algorithms – K-means and C-means – Data warehousing and its basic concepts.

Big Data Analytics : Information Retrieval and Data Mining – Big Data Essentials – Big Data and its importance, Four Vs - Machine Learning – Big Data Analytics – Data Visualization - Apache Hadoop & Hadoop EcoSystem - Data Serialization - Hive Architecture and Installation, HiveQL