KHAJA BANDANAWAZ UNIVERSITY, KALABURAGI
Faculty of Engineering and Technology
Computer Science and Engineering

Ph.D. Entrance Exam Syllabus

1. **Data Structures & Algorithms:** Arrays, Linked Lists, Trees (AVL, B-Tree, Tries), Graphs (DFS, BFS, Dijkstra, Kruskal, Prim), Hashing, Dynamic Programming, Complexity Classes (P, NP, NP-Complete, NP-Hard).

2. **Operating Systems:** Processes, Threads, Scheduling (FCFS, SJF, RR, Priority), Synchronization (Semaphores, Monitors), Deadlocks, Memory Management (Paging, Segmentation, Virtual Memory), File Systems.

3. **Computer Networks:** OSI & TCP/IP, Error Detection (CRC, Hamming), Flow & Congestion Control, Routing Algorithms (Distance Vector, Link State, OSPF, BGP), Transport Protocols (TCP/UDP), Application Protocols (HTTP, FTP, DNS, SMTP).

4. **Databases**: ER Model, SQL (Joins, Views, Triggers), Normalization (1NF–BCNF), Transactions (ACID), Concurrency Control, Recovery, Indexing, Distributed DBMS, NoSQL basics.

5. **Software Engineering**: SDLC Models, Agile & DevOps, UML (Use Case, Class, Sequence), Testing (Black-box, White-box, Regression, Automation), Project Management (COCOMO, Risk, Configuration).

6. **Programming**: C, C++, Python, OOP (Encapsulation, Inheritance, Polymorphism), Recursion, Functional Programming (Lambda, Map-Reduce).

7. **Theory of Computation & Compiler Design**: DFA, NFA, CFG, PDA, Turing Machines, Decidability, Lexical Analysis, Parsing (LL, LR), Code Optimization.

8. **Artificial Intelligence:** Search (DFS, BFS, A*), Knowledge Representation (Logic, Semantic Networks, Ontologies), Reasoning, Expert Systems, NLP basics.

9. **Machine Learning**: Regression, Classification, Clustering, Decision Trees, SVM, Neural Networks (Perceptron, Backpropagation), Ensemble Methods, Deep Learning (CNN, RNN basics).

10. **Data Science**: Data Preprocessing, Visualization, Descriptive Analytics, Hypothesis Testing, Feature Engineering.

11. **Big Data: Hadoop,** HDFS, MapReduce, Spark (RDD, DataFrames, MLlib).

12. **Internet of Things:** Architecture, Sensors & Actuators, Protocols (MQTT, CoAP, Zigbee), Applications (Smart Homes, Healthcare).

13. **Cloud Computing**: Virtualization, Service Models (IaaS, PaaS, SaaS), Deployment Models (Public, Private, Hybrid), Cloud Storage, AWS/GCP basics.

14. **Cybersecurity:** Cryptography (RSA, AES, Hashing, Digital Signatures), Authentication (OAuth, Kerberos), Security Attacks (DoS, SQL Injection), IDS/Firewalls, Security in Cloud & IoT.