Course Name: **MTech (CS) 1st Semester**

Subject Code: **CS-5010**

Subject Name: **Advanced Computer Architecture**

Aim of the Subject

Appreciate the technical skills necessary to be a capable computer architect.

Learning Outcomes

The students are expected to learn following after completion of the course:

- Complete and debug the design of a simple CPU with a 8085 microprocessor.
- Measure the memory access performance of a processor, and tune cache
- design parameters to improve performance.
- Analyze the condition of parallelism in parallel computing systems.
- To gain knowledge about the cloud computing based models.

Unit 1

Parallel Computer Models: Elements of Modern Computer, Evolution of Computer Architecture, The Von Neumann Model, Flynn's Classification of Parallel computing structures, System attributes to performances, Instructions, Instruction Set Architecture (ISA), 8085 microprocessor, RISC, CISC Architecture, ISA Design, and Addressing Modes.

Unit 2

Multiprocessors and Multicomputer: Shared Memory Multiprocessors, UMA, NUMA, COMA, Distributed Memory Multiprocessor, Message Passing Scheme. Multivector and SIMD Computers: Vector Supercomputers and SIMD Supercomputers. Memory Hierarchy. Vector Processing, Array Processing and VLIW Architecture.

Unit 3

Linear Pipeline Processors: Nonlinear pipeline Processors, Pipelining and its types, Data, control and Structural hazards and method to resolve them, Static RAM (SRAM), Dynamic RAM (DRAM), Cache coherence problem and method to resolve them: Write through and Write back. Cache coherence protocol: Snoopy and Directory based Protocol

Unit 4

Program and Network properties: Conditions of parallelism- Data dependency, control dependency, resource dependency. Bernstein Condition, Program partitioning and scheduling, program flow mechanisms, Hardware and Software parallelism. Interconnection Networks: Static and Dynamic networks such as Crossbar, multistage network etc.

Introduction to parallel programming:- Parallel Programming Models – Parallel Languages and Compilers

Unit 5

Cloud Computing Architecture: Cloud Computing, Advantages and Disadvantages, History of Cloud, Cloud Computing Technologies, Cloud Computing vs Grid Computing, How cloud works, Cloud Computing Applications, Security Risks of Cloud Computing, Types of Cloud: Public Cloud, Private Cloud, Hybrid Cloud, Community Cloud, Cloud Service Models, Virtualization

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Text Book(s)

1. Computer Architecture & Parallel Processing by Kai Hwang and Briggs.
2. Advanced Computer Architecture by Kai Hwang.

Reference Material(s)

All notes are available as material in Google classroom.

Course Name: **MTech (CS) 1st Semester**

Subject Code: **CS-6220**

Subject Name: **Internet Programming Using Java**

Aim of the Subject

To make students learn fundamental concept of coding and perform them practically and to develop problem-solving skills

Learning Outcomes

The students are expected to learn following after completion of the course:

- Have understanding of concepts logically.
- Have improvement of mathematical logics.
- understand of concepts practically of inheritance ,exceptional handling,
- multithreading ,applets and Jdbc.
- Have understanding of Jsp lifecycle and connection of Jsp with different
- database like oracle, ms-sql server and performing operations.

Unit 1

Review of java concepts: Features of Java, Object-oriented programming overview, Introduction of Java Technologies, How to write simple Java programs, Data Types, Variables, Memory concepts, control statements, looping, Method Call Stack and Activation Record, Argument Promotion and Casting, Scope of declaration and Method Overloading, String Handling: The String constructors, String operators, Character Exaction, String comparison, String Buffer. Arrays: Declaring and Creating Arrays, Enhanced for Statement, Passing Arrays to Method, Multidimensional Arrays, Variable-Length Argument lists, Using Command-line Arguments

Unit 2

Inheritance: Extending classes & related things. Packages and Interfaces: Defining a Package, Understanding CLASSPATH, Access Protection, Importing packages, creating own packages Exception Handling: Introduction, overview of doing it and keywords used, when to use it, Multithreading: What are threads, The java thread

model, Thread priorities, Thread life cycle, Thread Synchronization, Applets: Applet basics, Applet Architecture, Applet life cycle methods, Database connectivity: JDBC, The design of JDBC, Typical uses of JDBC

Unit 3

Introduction to HTTP, web Server and application Servers, Installation of Application servers, Config files, Web.xml. Java Servlet, Servlet Development Process, Deployment Descriptors, Generic Servlet, Lifecycle of Servlet. Servlet Packages, Classes, Interfaces, and Methods, Handling Forms with Servlet, Various methods of Session Handling, various elements of deployment descriptors.

Unit 4

JSP Basics: JSP lifecycle, Directives, scripting elements, standard actions, implicit objects. Connection of JSP and Servlet with different database viz. Oracle, MS-SQL Server, MySQL. java.sql Package. Querying a database, adding records, deleting records, modifying records, types of Statement. Separating Business Logic and Presentation Logic, Building and using JavaBean. Session handling in JSP, Types of errors and exceptions handling.

Unit 5

MVC Architecture Introduction to Remote Method Invocation, Introduction to Enterprise Java Bean, Types of EJB, Creating and working with Session Bean

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Text Book(s)

1. Java 2: The Complete Reference by Herbert Schildt, Tata McGraw- Hill, 8th Edition, 2011.

2. K. Mukhar, “Beginning Java EE 5: From Novice to Professional”, Wrox Press.

Reference Material(s)

1. The Java Programming Language, Ken Arnold , James Gosling , David Holmes, 3rd Edition, Person Education, 2000.

2. Head First Java, Kathy Sierra, Bert Bates, O’Reilly Publication, 2nd Edition, 2005

3. M. Hall, L. Brown, “Core Servlets and Java Serve

Course Name: **MTech (CS) 1st Semester**

Subject Code: **CS-6516**

Subject Name: **Advanced Operating Systems**

Aim of the Subject

To understand the principles in the design of distributed, multiprocessor and database operating systems.

Learning Outcomes

The students are expected to learn following after completion of the course:

- To get a comprehensive knowledge of the architecture of distributed systems.
- To understand the scheduling, process migration and shared memory issues and their solutions in distributed environments.
- To study and the distributed file system and naming for distributed computing environments.
- To get a knowledge of multiprocessor operating system and database operating
- systems.

Unit 1

Review of Operating System Concepts: Process management, Synchronization, Interprocess Communication techniques, Processor Scheduling, Memory Management, Device Management, File System etc. Limitations of centralized and uniprocessor operating systems. Need of advance operating systems, Types of advance operating systems.

Unit 2

Distributed Systems: Difference between network and distributed operating systems, Design objectives and features of distributed operating systems, Distributed systems architectures, distributed system software, and distributed operating systems.

Unit 3

Resource Management in distributed Computing:

(i) Distributed Scheduling, process management, process migration

(ii) Distributed Shared Memory

(iii) Distributed File System: File caching, replication management, Naming of resources, name resolution process.

Unit 4

Process management in distributed operating systems: Process synchronization and IPC, RPC, Clock synchronization, mutual exclusion, deadlock handling, security aspects, case studies.

Unit 5

Multiprocessor systems: Multiprocessor architecture, multiprocessor Operating systems, process synchronization and IPC, processor scheduling, memory management.

Database Systems' support: Need of OS support for databases, concurrency control in database systems.

Text Book(s)

[i] Distributed Operating Systems (Concept and Esign), II Edition, P. K. Sinha, PHI, 1997.

[ii] Advance Concepts in Operating Systems, MukeshSinghal, Niranjan G. Shivaratri, Mc Graw Hills, 1994.

Reference Material(s)

[iii] Modern Operating Systems(III Edition) , Andrew S.Tanenbomb, Pearson.

[iv] Distributed Systems (Concept and Design), II Edition, GEprgeCouloris, Jean Dollimore and Tim Kindberg, Addison-Wesley, 1994.

Course Name: **MTech (CS) 1st Semester**

Subject Code: **CS-5413**

Subject Name: **Data Mining and Warehousing**

Aim of the Subject

To clear the concepts, applications and research challenges of data mining and data warehousing.

Learning Outcomes

The students are expected to learn following after completion of the course:

- Have an understanding of the foundations, the design, the maintenance, the evolution,
- and the use of data warehouses
- To understand various issues related to improvement in performance of data warehouse.
- Understand the fundamentals of data mining Data Mining Functionalities.
- Have an understanding of the principles, methods, techniques, and tools that underpin
- successful data mining applications.
- Understand what is Web Mining, Web content mining, Web Structure mining and to know
- the concept of Text mining.

Unit 1

Introduction: Data Warehouse, Evolution, Definition, Very large database, Application, Multidimensional Data Model, OLTP vs Data Warehouse, Warehouse Schema, Data Warehouse Architecture,

Data Warehouse Server, Data Warehouse Implementation, Metadata, Data Warehouse Backend Process: Data Extraction, Data Cleaning, Data Transformation, Data Reduction, Data loading and refreshing. ETL and Data warehouse, Metadata

Unit 2

Structuring/Modeling Issues, Derived Data, Schema Design, Dimension Tables, Fact Table, Star Schema, Snowflake schema, Fact Constellation, De-normalization, Data Partitioning, Data Warehouse and Data Marts.OLAP, Strengths of OLAP, OLTP vs OLAP, Multi-dimensional Data,

Slicing and Dicing, Roll-up and Drill Down, OLAP queries, Successful Warehouse, Data Warehouse Pitfalls, DW and OLAP Research Issues, Tools. SQL Extensions, PLSQL.

Unit 3

Fundamentals of data mining, Data Mining definitions, KDD vs Data Mining, Data Mining Functionalities, Issues and challenges in Data Mining. Data Mining Primitives, Descriptive and Predictive Data mining, Data Mining applications-Case studies. Association rules: Methods to discover association rules. Various algorithms to discover association rules like A Priori Algorithm. Partition, Pincer search, Dynamic Itemset Counting Algorithm etc

Unit 4

Cluster Analysis Introduction : Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Algorithms, Hierarchical and Categorical clustering, Decision Trees, Neural networks, Genetic Algorithm, SVM, Regression

Unit 5

Web Mining , Web content mining, Web Structure mining, Text mining, Temporal Data Mining, Spatial Data Mining, Introduction to Big Data Analytics

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Text Book(s)

1. Data Mining Techniques – ARUN K PUJARI, Second Edition, University Press,2001

2. Data Mining-Introductory and Advanced Topics-Margaret H. Dunham,

2. Data Mining – Concepts and Techniques - JIAWEI HAN & MICHELINE KAMBER Harcourt India.

3. Building the Data Warehouse- W. H. Inmon, Wiley Dreamtech India Pvt. Ltd.Fourth Edition

4. The Data Warehouse Life cycle Tool kit – RALPH KIMBALL WILEY STUDENT Third Edition

Reference Material(s)

Essential References

1. Data Warehousing in the Real World – SAM ANAHORY & DENNIS MURRAY. Pearson Edn Asia.

2. Data Warehousing Fundamentals – PAULRAJ PONNAIAH WILEY STUDENT EDITION

3. Data Mining Introductory and advanced topics –MARGARET H DUNHAM, PEAR

Course Name: **MTech (CS) 1st Semester**

Subject Code: **CS-6221**

Subject Name: **Advanced Algorithm Design**

Aim of the Subject

The aim of the course is to make students learn & apply algorithmic techniques in problem solving.

Learning Outcomes

The students are expected to learn following after completion of the course:

- Design and implement algorithms to solve real world problems.
- Analyze time complexity and space complexity of algorithms.

Unit 1

Introduction to Algorithms, Time & Space Complexity, Sorting: Merge Sort, Quick Sort, Heap Sort; Searching: Linear Search, Binary Search, Hashing.

Unit 2

Dynamic Programming & its Applications: Fibonacci Computation, Longest Common Subsequence Problem, Edit Distance Problem; Greedy Techniques & its Applications: Knapsack Problem.

Unit 3

Graph Algorithms, Traversal: BFS, DFS; Shortest Path: Dijkstra's Shortest Path Algorithm; Computation of Minimum Spanning Trees: Prim Algorithm, Kruskal Algorithm.

Unit 4

String Matching Algorithms: Naive Algorithm, KMP Algorithm, Rabin-Karp Algorithm

Unit 5

Theory of NP Complete Problems, P, NP, NP Hard, NP Complete and related Reductions, Cook's Theorem.

Text Book(s)

[1] Introduction to Algorithms, by Cormen, Leiserson, Rivest, and Stein, MIT Press, Third Edition, 2009. [CLRS]

Reference Material(s)

[1] Algorithms, by Dasgupta, Papadimitrou and Vazirani, McGraw Hill Education, 2006.