SYLLABUS

M.Tech. (COMPUTER SCIENCE)

1st SEMESTER

Session 2020 - 2021

Mission of SCS&IT, DAVV

To produce world-class professionals who have excellent analytical skills, communication skills, team building spirit and ability to work in cross cultural environment.

To produce international quality IT professionals, who can independently design, develop and implement computer applications.

Professionals who dedicate themselves to mankind, who are environment conscious, follow social norms and ethics.

School of Computer Science & IT,
Devi Ahilya Vishwa Vidyalaya, Indore
www.scs.dauniv.ac.in

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.

Objectives

1. Understand the role of abstraction in the design of large digital systems, and explain the major software and hardware abstractions in contemporary computer systems.

2. Analyze the performance of digital systems using measures such as latency and throughput.

3.Design simple hardware systems based on a variety of digital abstractions such as ROMs and logic arrays, logic trees, state machines, pipelining, and buses. synthesize digital systems from a library of representative components and test the designs under simulation.

4. Understand the operation of a moderately complex digital system -- a simple RISC-based computer -- down to the gate level, and be able to synthesize, implement, and debug its components.

5. Understand the design of Multiprocessor systems.

6. Understand the operations of cloud.

Learning Outcomes

1. Complete and debug the design of a simple CPU with a given RISC-based instruction set.

2. Measure the memory access performance of a processor, and tune cache design parameters to improve performance.

3. Analyze the operation of page-based virtual memory systems.

Unit 1

Instruction Set Architectures: The von Neumann Model, Key Idea: Stored-program Computer, Anatomy of a von Neumann Computer, Instructions, Instruction Set Architecture (ISA), ISA Design, Beta ISA: Storage, Storage Conventions, Beta ISA: Instructions, Beta ALU Instructions, Beta ALU Instructions with Constant, Beta Load and Store Instructions,Beta Branch Instructions, Beta JMP Instruction

Unit 2

Building the Beta:CPU Design Tradeoffs, Processor Performance, Approach: Incremental Featurism, Multi-ported Register File, ALU Instructions, Instruction Fetch/Decode, ALU Op Datapath I, ALU Op Datapath II, Beta ALU Instructions, Beta ALU Instructions with Constant, Beta Load and Store Instructions,Beta Branch Instructions, Beta JMP Instruction, LDR Instruction , Exceptions, Exception

Processing, Exception Implementation, Beta: Our "Final Answer", Control Logic The Memory Hierarchy: Memory Technologies, Static RAM (SRAM), Dynamic RAM (DRAM), Non-Volatile Storage: Flash, Non-Volatile Storage: Hard Disk, The Locality Principle, Caches, A Typical Memory Hierarchy, Basic Cache Algorithm, Direct-Mapped Caches, Fully-Associative Cache, N-way Set-Associative Cache , Replacement Policies, Write Policy, Write-back, Write-back with "Dirty" Bits, Summary: Cache Tradeoffs

Unit 3

Pipelining the Beta: Reminder: Single-Cycle Beta, Pipelined Implementation, Pipeline Hazards, Simplified Unpipelined Beta Datapath, 5-Stage Pipelined Datapath, Pipelined Control, Pipeline Diagrams, Data Hazards, Resolving Hazards, Stall Logic , Bypass Logic, Control Hazards, Resolving Control Hazards, Branch Prediction , Exceptions

Unit 4

Parallel Processing: Processor Performance, 5-Stage Pipelined Processors, Improving 5-Stage Pipeline Performance, Instruction-level Parallelism (ILP), Wider or Superscalar Pipelines, A Modern Out-of-Order Superscalar Processor, Multicore Processors, Multicore Caches, Fix: "Snoopy" Cache Coherence Protocol

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

Text Book(s)

Computation Structures (MIT Electrical Engineering and Computer Science)
by Stephen A. Ward , Robert H. Halstead

Reference Material(s)

https://computationstructures.org/

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.

Objectives

- 1. To present an overview of data warehousing process.
- 2. To make students understand tools and techniques of On Line Analytical Processing (OLAP)
- 3. Learn to create data warehouse data models, data warehouse design, storage and implementation techniques.
- 4. Identify and learn useful algorithms to discover useful knowledge out of tremendous data volumes. Also to determine in what application areas can data mining be applied.
- 5. To present an overview of Big Data Analytics techniques.

Learning Outcomes

A student completing course unit 1 should:

1) Have an understanding of the foundations, the design, the maintenance, the evolution, and the use of data warehouses

2) To understand data warehouse architecture.

3) To understand the step by step process of data warehouse development including data extraction, cleaning, loading and refreshing.

4) To understand various issues related to improvement in performance of data warehouse.

A student completing course unit 2 should:

1) Practice SQL & PL/ SQL required in data warehouse environment.

2) To master the basic range of techniques for creating, controlling, and navigating dimensional business databases, by being able to use a tool for dimensional modeling and analysis.

3) Understand multidimensional data model, OLAP, OLAP operations and work on OLAP queries

A student completing course unit 3 should:

1) Understand the fundamentals of data mining Data Mining Functionalities.

2) Have an understanding of the data mining process, its motivation, applicability, advantages and pitfalls.

3) Understand how to move from Data Warehousing to Data Mining,

4) Understand Issues and challenges in Data Mining.

5) Understand Data Mining Query Languages and Data Mining applications

A student completing course unit 4 should:

1)   Understand different data mining techniques.

2)   Understand various algorithms to find association rules.

3)   Have an understanding of the principles, methods, techniques, and tools that underpin successful data mining applications.

4)   Understand different clustering techniques.

5)   Understand data mining through Decision Trees, Neural networks and Genetic Algorithm.

A student completing course unit 5 should:

1)   Understand what is Web Mining, Web content mining, Web Structure mining and to know the concept of Text mining.

2)   Understand the concept of Temporal Data Mining, Spatial Data Mining.

3)   Be able to understand the methods and techniques of Big Data Analytics.

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

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, PEARSON EDUCATION

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

Objectives

1. To make students learn the basics of coding.
2. To develop concepts in a logical and creative way.

Learning Outcomes

Description of knowledge to be acquired:

A student completing course unit 1 should :

1. Have an understanding of basics of coding with syntax.
2. To perform concepts practically including topics of core java.

A student completing course unit 2 should :

1. Have understanding of concepts logically.
2. Develop programming solving skills.
3. Have improvement of mathematical logics.
4. understand of concepts practically of inheritance ,exceptional handling, multithreading ,applets and Jdbc.

A student completing course unit 3 should :

1. Have understanding of fundamentals of HTTP and servlets.
2. Have understanding methods and to perform them practically.

A student completing course unit 4 should :

1. Have understanding of basics of Jsp
2. Have understanding of Jsp lifecycle and connection of Jsp with different database like oracle, ms-sql server and performing operations.

A student completing course unit 5 should :

1. Have understanding of basics of EJB and its types.
2. Have knowledge of creating and working with session bean.

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

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 Server Pages", 2nd edition, Pearson Education
4. G. Franciscus, "Struts Recipes", Manning Press

5. C. Bauer, G. King, "Hibernate in Action", Manning Press
6. B. Basham, K. Sierra, B. Bates, "Head First Servlet and JSP", 2nd Edition, O'Reilly Media.

CS-5010: Advanced Computer Architecture Assignments

1. Consider a workload where 50% of the execution time consists of multimedia processing for which the MMX instruction set extensions might be helpful. According to Amdahl's law, what is the maximum speedup that can be achieved by implementing them?

2. When pipelined microprocessors were first becoming more common (early to mid 80's) designers believed that RISC instruction sets were easier to pipeline because...?

3. We have seen how pipelining improves the instruction throughput increasing effective performance. Machines with deeper pipelines perform less work per pipestage but have more "in-flight" instructions processing at the same time allowing instructions to complete at a higher rate. In class we discussed several reasons why the effectiveness of deeply pipelined machines can be limited – too much pipelining can be detrimental. Describe two reasons here.

4. List and explain three types of pipeline hazards.

5. List and explain three types of cache misses.

6. Implement a simulator for Beta machine.

CS-5413: Data Mining and Warehousing

ASSIGNMENTS and LAB Manual :
1. Search a voluminous data file and understand it.(hint: you may get free data from internet)
2. Replace all tabs with commas from file or vice versa.
3. Normalize the data: for each value, set the minimum value to 0 and the maximum to 100.
4. Transform the data file (text, excel etc) into database.
5. Create a subject oriented data warehouse.
6. Analysis of existing data (semantical correctness, completeness)
7. Use of free ETL tool.
8. Use of data mining algorithms.
9. Describe an application area where data mining algorithms can be applied. Description should contain application scenario, scale of the problem, existing approach, data mining algorithm that can be used and the benefits of using the algorithms, Prepare data mining models.

Note: Extra assignments may be provided in classroom.

PROJECT (Any One for one team):

Data mining application using any freeware data mining tool.

Deliverables:

a. **Project proposal**: A one-page description of what you plan to do for your project, due Nov. 1st. Please include:
   i. Who is in your group
   ii. Project title
   iii. Brief description of the problem you'll solve or the question you'll investigate
   iv. What data you'll use and where you'll get it
   v. Which algorithms/techniques you plan to use
b. **Final project write up**   This is a comprehensive description of your project. You should include the following:

   1. Project idea
   2. Details of data
   3. ETL and Data mining implementation
   4. Key results and metrics of your system

c. **Final presentation**: In the last week of class , each team will present their project to the rest of the class. The presentation should not be more than 15 minutes.

School of Computer Science & IT ,DAVV, Indore

CS-6220: Internet Programming using Java

M.Tech.(CS) & (NM)

Assignment

Note :

Study the uploaded PDF and PPT that we had discussed earlier in class ,based on this study and prepare assignment in word file .

Q1. Write a java program that has a method for the calculation of fourth power of 2.

Q 2. Write a java program that will accept command line argument and print the same.

Q 3. Write a java program that has a method for initialization of variable to 10 and 20 &another method display the same.

Q 4. Write a java program that prints the different time zones available with the time zones class.

Q 5. Write a java program that prints details about current date, time, month, year, day of the month, day of the week.

Q 6. Write a java program that will display the message "weight of bundle -5 kgs" in a constructor &display the weight in kilograms & grams.

Q 7. How to determine upper bound for two dimensional array in java.

Q 8. Write a java program to read 10 numbers and store in array .list out duplicate numbers, number of times duplication occurs.