Advanced Software Engineering

Course: M.Tech. (CS&E) Subject Code: 14MCSC101 Maximum Marks: 50

Semester: I **Contact Hours: 60** Credits: 4:0:0

Examination Question Paper Pattern

1. All questions carry equal marks.

2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

The subject provides the basic knowledge of Software Engineering interm of process, specification, validation. The course main concentrates on critical systems.

Course Objective

- To understand the software life cycle models
- To understand the importance of the software development process •
- To understand correct and robust software products

Unit-1

Introduction and Review of Software Process Models: FAQs about Software Engineering; Professional and ethical responsibility; Software process models; Process iteration; Process activities; Computer-Aided Software Engineering.

PART - A

Unit-2

Rapid Software Development, Software Reuse Agile methods; Extreme programming; Rapid application development, Reuse landscape; Design patterns; Generator-based reuse; Application frameworks; Application system reuse

Unit-3

CBSE, Software Evolution: Components and component models; Component-Based Software Engineering (CBSE). Program evolution dynamics; Software maintenance; Evolution processes; Legacy system evolution

Unit-4

Distributed Systems Architecture: Multiprocessor architectures; Client-Server architectures; Distributed object architectures; Inter-Organizational distributed computing

Unit-5

Verification and Validation: Planning verification and validation; Software inspections; System testing; Component testing; Test case design; Test automation

PART - B

Unit-6

08Hrs Critical Systems, Specifications of Critical Systems: What are critical systems? Examples; System dependability, availability and reliability, Risk-driven specification; Safety specification; Security specification; Software reliability specification

08Hrs

06Hrs

08Hrs

08Hrs





Unit– 7

08Hrs

Critical Systems Development, Validation: Dependable processes; Dependable programming; Fault tolerance and fault-tolerant architectures, Reliability validation; Safety assurance; Security assessment; Safety and dependability cases.

Unit– 8

06Hrs

Real-Time Software Design: Real-time systems; System design; Monitoring and control systems; Data acquisition systems

Text Books

1. Ian Sommerville: Software Engineering, 8th Edition, Addison-Wesley, 2007

Reference Books

1. Roger S. Pressman: Software Engineering: A Practitioner's Approach, 7th Edition, Mc Graw-Hill Publications, 2007

2. Pfleeger: Software Engineering Theory and Practice, 2nd Edition, Pearson Education, 2001

3. Waman S Jawadekar: Software Engineering Principles and Practice, Tata McGraw Hill, 2004

Data Structures and Algorithms

Course: M.Tech. (CS&E) Subject Code: 14MCSC102 Maximum Marks: 50

Semester: I Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

- To introduce the concepts of analysis and design of computer algorithms.
- To analyze the asymptotic performance of algorithms.
- To demonstrate a familiarity with major algorithms and data structures.
- To apply important algorithmic design paradigms and methods of analysis.
- To synthesize efficient algorithms in common engineering design situations.
- To appreciate the role of algorithms in problem solving and software design; selecting among competing algorithms and justifying choices based on efficiency.
- To understand the specifications and implementations of standard data structures and be able to select appropriate structures in developing programs.
- To develop programs using different problem-solving approaches, and be able to recognize when a particular approach is most useful.

Course Objective

Student should be able to

- Define algorithm formally and informally
- Explain elementary and advanced data structures
- Explain the different algorithms for solving typical problems
- Describe the process of algorithm design and analysis
- Explain the complexity of algorithms
- Design recursive and non-recursive algorithms for, say, computing a Fibonacci number
- Explain P, NP and NP-completeness

PART - A

Unit- 1

Introduction: Role of Algorithms in Computing, Analyzing Algorithms, Designing Algorithms, Asymptotic Notation, Standard Notations and Functions.

Unit- 2

Foundations: Divide and Conquer, Probabilistic Analysis, Randomized Algorithms.

Unit -3

Sorting Algorithms: Heapsort, Quicksort, Sorting in Linear Time.

3 / 49

08Hrs

07Hrs



M.Tech in Computer Science and Engg.

Unit- 4

Data Structures: Elementary Data Structures, Hash Tables.

Unit -5

Trees: Binary Search Trees, Red-Black Trees.

Unit- 6

Advanced Design and Analysis Techniques: Dynamic Programming, Greedy Algorithms, Amortized Analysis.

PART - B

Unit -7

Advanced Data Structures: B-Trees, Fibonacci Heaps, Data Structures for Disjoint Sets.

Unit- 8

NP-Completeness: Polynomial Time, Polynomial Time Verification, NP-Completeness and Reducibility, NP-Completeness Proofs, NP-Complete Problems.

Text Book

1. Introduction to Algorithms, 3rd Edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, The MIT Press, 2009.

Reference Book

1. Introduction to the Design and Analysis of Algorithms, 3rd Edition by Anany Levitin, Addison- Wesley Longman, 2011.



08Hrs

07Hrs

07Hrs

08Hrs

Operating System and Design Principles

Course: M.Tech.(CS&E) Subject Code: 14MCSC103 Maximum Marks: 50

Semester: I Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

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- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

Consider and address the issues in the design of modern operating systems of both single and multiple processor systems. Students will also obtain programming experience in operating system implementation. Provides the overview of the operating system, the concepts of process management, memory management, storage management, protection and security issues, and distributed systems.

Course Objective

- To understand operating system objectives and functions
- To learn developments leading to modern operating systems
- To learn about modern operating systems like UNIX, LINUX, Windows
- To learn about characteristics of Embedded operating systems
- To learn the design and architecture of UNIX,LINUX operating systems

Unit-1

Operating System objectives and functions, The evolution of operating systems, Major achievements, Developments leading to modern operating systems, Microsoft windows overview, Traditional UNIX systems, Modern UNIX systems, Linux, what is a process, Process States, Process Description, Process Control, Execution of the operating system, Security Issues, Unix SVR4 Process Management, Processes and threads, Symmetric Multiprocessing, Microkernels, Linux Process and Thread Management

PART - A

Unit-2

Principles of Concurrency, Mutual Exclusion: Hardware Support, Semaphores, Monitors, Message Passing, Readers/Writers Problem, Principles of Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategy, Dining Philosophers Problem, Linux Kernel Concurrency Mechanisms.

Unit-3

Memory Management Requirements, Memory Partitioning, Paging, Segmentation, Security Issues, Hardware and Control Structures, Operating system Software, UNIX and Solaris Memory Management, Linux Memory Management, Windows Vista Memory Management.

Unit-4

07Hrs

08Hrs

07Hrs

Types of Scheduling, Scheduling Algorithms, Traditional UNIX Scheduling, Multiprocessor Scheduling, Real-Time Scheduling, Linux Scheduling.

PART- B

Unit-5

I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling, RAID, Disk Cache, Linux I/O, File Management Overview, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management, File System Security, Linux File Management.

Unit-6

Embedded Systems, Characteristics of Embedded Operating Systems, eCOS, TinyOS, Computer Security Concepts, Threats, Attacks and Assets, Intruders, Malicious Software Overview, Viruses, Worms and Bots, Rootkits.

Unit-7

Computer Security Techniques: Authentication, Access Control, Intrusion Detection, Malware Defense, Dealing with Buffer Overflow Attacks, Windows Vista Security.

Unit-8

Distributed Processing, Client/server and Clusters: Client/server Computing, Distributed Message Passing, Remote Procedure Calls, Clusters, Windows Vista Cluster Server, Sun Cluster, Beowuful and Linux Clusters.

Text Books

1. Operating Systems: Internals and Design Principles by William Stallings 6th Edition Pearson Education.

Reference Books

1. Operating Systems: Gary Nutt, 3rd Edition, Pearson Education, 2005.

2. Operating Systems: Deitel, Deitel and Choffnes, 3rd Edition, Pearson Education, 2004.

3. Operating System Concepts: Silberschatz, 6th Edition, John Wiley and Sons, 2003.

4. Operating System Principles: Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 7th Edition, Wiley-India, 2006.

5. The LINUX Kernel Book: Remy Card etal, John Wiley, 1998.



08Hrs

08Hrs

07Hrs

Advances in Data Base Management Systems

Course: M.Tech. (CS&E) Subject Code: 14MCSC104 Maximum Marks: 50 Semester: I Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

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- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

Typical Database Management Systems (DBMSs) provide features such as indexing structures, concurrency control, recovery control, transactional models, and query optimization. Typical DBMSs have been designed to address the requirements of retail- and banking-like systems. However, this narrow view of DBMSs has changed significantly over the last two decades to include emerging applications from various domains. This course will cover several advanced techniques in the areas of distributed and parallel databases, deductive databases, object-relational and semi-structured data models, data warehouse, data mining and OLAP techniques.

Course Objective

- To understand advanced database techniques
- To learn how modern database systems implement transaction management
- To learn the design and architecture of parallel & distributed database systems
- To understand and apply principles of object and deductive databases
- To understand how enterprise applications use databases technologies

PART - A

Unit - 1

Introduction: Mobile Databases. Main Memory Databases. Multimedia Databases. GIS. Temporal Databases. Biological Databases, Architectures for Parallel Databases. Parallelizing Individual Operations. Parallel Query Optimization. Introduction to Distributed Databases. Distributed DBMS Architectures.

Unit - 2

Distributed DB Operations: Storing Data in a Distributed DBMS. Distributed Query Processing. Updating Distributed Data. Distributed Transactions. Distributed Concurrency Control. Distributed Recovery.

Unit - 3

Object Database Systems: Structured Data Types. Operations on Structured Data. Encapsulation and ADTs. Inheritance. Objects, OIDs and Reference Types. Database design for an ORDBMS. ORDBMS Implementation Challenges. OODBMS. Comparing RDBMS, ORDBMS and OODBMS.

Unit - 4

07Hrs

08Hrs

07Hrs



Deductive Databases: Recursive Queries. Theoretical foundations of Deductive Databases. Recursive Queries with Negation. From Datalog to SQL. Evaluating Recursive Queries.

PART - B

Unit - 5

Data warehousing and Decision Support: OLAP and Multidimensional Data Model. Multidimensional Aggregation Queries. Finding Answers Quickly. Implementation Techniques for OLAP. Data Warehousing. Views and Decision Support. View Materialization. Maintaining Materialized Views.

Unit - 6

Data Mining: Introduction to Data Mining. Counting Co-occurrences. Mining for Rules. Tree-Structured Rules. Clustering. Similarity Search over Sequences. Incremental Mining and Data Streams.

Unit - 7

Information Retrieval and XML Data: Databases, Information Retrieval and XML. Introduction to Information Retrieval. Indexing for Text Search. Web Search Engines. Managing Test in DBMS. A Data Model for XML. XQuery – Querying XML Data. Efficient Evaluation of XL Queries.

Unit - 8

Spatial Data Management: Types of Spatial Data and Queries. Applications Involving Spatial Data. Introduction to Spatial Indices. Indexing Based on Space-Filling Curves. Grid Files. R Trees – Point and Region data. Issues in High Dimensional Indexing. Advanced Transaction Processing, Introduction to MongoDB & Pivotal Greenplum Database.

Text Book

1. Database Management Systems ,Raghu Ramakrishnan and Johannes Gehrke, Third Edition. McGraw Hill 2003.

Reference Books

1. Database System Concepts, Abraham Silberschatz, Henry F.Korth and S.Sudarshan. Fifth Edition. McGraw Hill 2006.

2. Web References for MongoDB and Pivotal Greenplum Database.



08Hrs

07Hrs

07Hrs

C# & .NET Concepts

Course: M.Tech. (CS&E) Subject Code: 14MCSC151 Maximum Marks: 50

Semester: I Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

JAIN UNIVERSITY

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

The course is aimed towards providing students with the knowledge and skills they need to develop C# applications for the Microsoft .NET Platform. The course focuses on C# program structure, language syntax, and implementation details. C# was created to be the programming language best suited for writing enterprise applications for .NET. C# combines the high productivity of Microsoft Visual Basic with the raw power of C++. It is a simple, object-oriented & type-safe programming language that is based on the C and C++ family of languages.

Course Objective

- To get familiarize with Microsoft.Net, C# and ASP.NET technologies
- To understand the different concepts and features of .NET coding, debugging and developing of Windows and web applications.
- To gain an understanding of the Microsoft .NET architecture.
- To understand and work with data from multi sources like objects, XML, databases using Language Integrated Query (LINQ).
- To attain a detailed working knowledge of C-Sharp implicit types, object initializers, delegates, anonymous types & methods, extension methods, lambda expression, LINQ and many more.

PART - A

Unit- 1

Introducing C# and the .NET Platform: Introducing the Building Blocks of the .NET Platform (the CLR, CTS, and CLS), An Overview of .NET Assemblies, The Assembly/Namespace/Type Distinction, The Platform-Independent Nature of .NET, The Anatomy of a Simple C# Program, Building C# applications using csc.exe, Building .NET Applications Using Visual Studio2010

Core C# Programming Constructs: An Interesting Aside: Some Additional Members of the System Environment Class, The System Console Class, System Data Types and C# Shorthand Notation, Working with String Data, C# Iteration Constructs, Methods and Parameter Modifiers, Understanding C# Arrays, Understanding the Enum Type, Understanding the Structure Type, Understanding Value Types and Reference Types, Understanding C# Nullable Types

Unit- 2

Object Oriented Programming in C#: Introducing the C# Class Type, Understanding Constructors, The Role of the this Keyword, Understanding the static Keyword, Defining the Pillars of OOP, C# Access Modifiers, The First Pillar: C#'s Encapsulation Services, Understanding Automatic Properties, Understanding Object Initializer Syntax, Working with Constant Field Data, Understanding Partial Types, Understanding Inheritance and Polymorphism, The Basic Mechanics of Inheritance, The Second Pillar of OOP: The Details of Inheritance, Programming for Containment/Delegation, The Third Pillar of OOP: C#'s Polymorphic Support, Understanding Base Class/Derived Class Casting Rules, The Master Parent Class: System.Object

Unit- 3

Understanding Structured Exception Handling: The Role of .NET Exception Handling, The Simplest Possible Example, Configuring the State of an Exception, System-Level Exceptions (System.SystemException), Application-Level Exceptions (System.ApplicationException), Processing Multiple Exceptions, Who Is Throwing What?, The Result of Unhandled Exceptions, Debugging Unhandled Exceptions Using Visual Studio, A Brief Word Regarding Corrupted State Exceptions (CSE) Understanding Object Lifetime: Classes, Objects, and References, The Basics of Object Lifetime, The Role of Application Roots, Understanding Object Generations, The System. GC Type, Building Finalizable Objects, Building Disposable Objects, Building Finalizable and Disposable Types

Unit- 4

Working with Interfaces: Understanding Interface Types, Defining Custom Interfaces, Implementing an Interface, Invoking Interface Members at the Object Level, Interfaces As Parameters, Interfaces As Return Values, Arrays of Interface Types, Implementing Interfaces Using Visual Studio 2010, Building Enumerable Types (IEnumerable and IEnumerator), Building Cloneable Objects (ICloneable), Building Comparable Objects(IComparable)

Delegates, Events, and Lambdas: Understanding the .NET Delegate Type, Defining a Delegate Type in C#, The System Multicast Delegate and System Delegate Base Classes, The Simplest Possible Delegate Example, Sending Object State Notifications using Delegates, Understanding C# Events, Understanding Lambda Expressions

Unit- 5

PART - B

Introducing LINQ to XML: LINQ Specific Programming Constructs, Understanding the Role of LINQ, Applying LINQ Queries to Primitive Arrays, Returning the Result of a LINQ Query, a Tale of Two XML APIs, Members of the System. Xml Linq Namespace, Working with XElement and XDocument, Manipulating an in Memory XML Document. Multithreaded Programming: The Process/AppDomain/Context/Thread Relationship, Invoking a Method Asynchronously, The System Threading Namespace, The System Threading Thread Class, Programmatically Creating Secondary Threads, The Issue of Concurrency, Programming with Timer Callbacks, Understanding the CLR Thread Pool.

08Hrs

07Hrs

08Hrs



Unit- 6

ADO .NET Part I: The Connected Layer : A High-Level Definition of ADO .NET , Understanding ADO .NET Data Providers, The Types of the System.Data Namespace, Abstracting Data Providers Using Interfaces, Creating the AutoLot Database, The ADO .NET Data Provider Factory Model , Understanding the Connected Layer of ADO .NET, Working with Data Readers, Building a Reusable Data Access Library, Creating a Console UI–Based Front End, Understanding Database Transactions ADO .NET Part II: The Disconnected Layer: Understanding the Disconnected Layer of ADO .NET, Understanding the Role of the DataSet, Working with DataColumns, Working with DataRows, Working with DataTables, Binding DataTable Objects to Windows Forms GUIs, Working with Data Adapters Adding Disconnection Functionality to AutoLotDAL.dll, Multitabled DataSet Objects and Data Relationships

Unit- 7

Building ASP.NET Web Pages: The Role of HTTP, Understanding Web Applications and Web Servers, The Role of HTML, The Role of Client-Side Scripting, Posting Back to the Web Server, The Feature Set of the ASP.NET API, Building a Single File ASP.NET Web Page, Building an ASP.NET Web Page using Code Files, ASP.NET Web Sites and ASP.NET Web Applications, The ASP.NET Web Site Directory Structure, The Inheritance Chain of the Page Type, Interacting with the Incoming HTTP Request, Interacting with the Outgoing HTTP Response, The Life Cycle of an ASP.NET Web Page, The Role of the Web.config File.

Unit- 8

ASP.NET Web Controls, Master Pages and Themes: Understanding the Nature of Web Controls, The Control and WebControl Base Classes, Major Categories of ASP.NET Web Controls, Building the ASP.NET Cars Web Site, The Role of the Validation Controls, Working with Themes.

ASP.NET State Management Techniques: The Issue of State, ASP.NET State Management Techniques, Understanding the Role of ASP.NET View State, The Role of the Global.asax File, Understanding the Application/Session Distinction, Working with the Application Cache, Maintaining Session Data, Understanding Cookies, The Role of the <sessionState> Element, Understanding the ASP.NET Profile API.

Text Books

1. Pro C# 2010 and the .NET 4 Platform, Andrew Troelsen, 5th Edition, Apress

Reference Books

- 1. C# in Depth, Jon Skeet, 3rd Edition, Manning Publications
- Microsoft Visual C# 2013 Step by Step (Step by Step Developer), John Sharp, Microsoft Press, 1st edition
- 3. Web reference: www.c-sharpcorner.com



08Hrs

07Hrs



Object Oriented Information System Design

Course: M.Tech. (CS&E) Subject Code: 14MCSC152 Maximum Marks: 50 Semester: I Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

1. All questions carry equal marks.

2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

This course introduces students to the fundamentals of analysis and design of computer information systems to meet business requirements. Students will learn and practice various methods, tools and techniques used by the systems analyst at each phase within the systems development cycle. The field of system analysis and design is continually evolving. Today, the most exciting change to system analysis and design is the move to object-oriented techniques. The course will cover object-oriented systems analysis and design such as project management and information gathering techniques.

Course Objective

- Become familiar with major systems development methodologies and the criteria for their selection.
- Describe the key concepts, major objectives, task set, and tools used in each phase of the SDLC.
- Understand fundamental concepts and object-oriented techniques of systems analysis and design.
- Be able to gather and document system requirements.
- Create functional models of the system with activity diagrams, use-case diagrams, and use-case descriptions.
- Create structural models of the system with class diagrams.
- Create behavioral models of the system with state charts and sequence diagrams.
- Understand and employ the fundamental principles of user-interface design
- Demonstrate the ability to use project management tools
- Be able to analyze business processes and data of an organization to model its information processing needs.
- Communicate with potential systems users effectively and professionally, to elicit and define user requirements.
- Demonstrate the ability to communicate effectively in both written and oral forms during systems development process

PART - A

Unit- 1

07Hrs

Introduction to Systems Analysis and Design - The Systems Development Life Cycle, Systems Development Methodologies, Object-Oriented Systems Analysis and Design (OOSAD), The Unified Process, The Unified Modeling Language, Project Team Roles and

Skills. Project Initiation – Introduction, Project Identification, Feasibility Analysis, Project Selection, Applying the Concepts at CD Selection.

Unit- 2

Project Management - Identifying Project Size, Creating and Managing the Work plan, staffing the Project, Coordinating Project Activities, Applying the Concepts at CD Selections. Requirements Determination - Requirements Determination, Requirements Analysis Strategies, Requirements-Gathering Techniques, the System Proposal, Applying the Concepts at CD Selections.

Unit- 3

Functional Modeling - Business Process Modeling with Activity Diagrams, Use-Case Descriptions, Use-Case Diagrams, Creating Use-Case Descriptions and Use-Case Diagrams, Refining Project Size and Effort Estimation Using Use-Case Points, Applying the Concepts at CD Selections.

Unit- 4

Structural Modeling - Structural Models, CRC Cards, Class Diagrams, Creating CRC Cards and Class Diagrams, Applying the Concepts at CD Selections. Behavioral Modeling -Interaction Diagrams, Behavioral State Machines, CRUD Analysis, Applying the Concepts at CD Selections.

PART - B

Unit- 5

Moving on to Design - Verifying and Validating the Analysis Models, Evolving the Analysis Models into Design Models, Packages and Package Diagrams, Design Strategies, Developing the Actual Design Alternative Matrix, Applying the Concepts at CD Selections. Class and Method Design - Review of the Basic Characteristics of Object Orientation, Design Criteria, Object Design Activities, Constraints and Contracts, Method Specification, Applying the Concepts at CD Selections.

Unit- 6

Data Management Layer Design - Object-Persistence Formats, Mapping Problem-Domain Objects, Optimizing RDBMS-Based Object Storage, Nonfunctional Requirements and Data Management Layer Design, Designing Data Access and Manipulation Classes, Applying the Concepts at CD Selections.

Unit- 7

Human–Computer Interaction Layer Design - Principles for User Interface Design, User Interface Design Process, Navigation Design, Input Design, Output Design, Nonfunctional Requirements and Human–Computer Interaction Layer Design, Applying the Concepts at CD Selections.

Unit- 8

Physical Architecture Layer Design - Elements of the Physical Architecture Layer, Infrastructure Design, Nonfunctional Requirements and Physical Architecture Layer Design, Hardware and Software Specification, Applying the Concepts at CD Selections.

Text Book

1. Alan Dennis, Barbara H. Wixom, and David Tegarden, Systems Analysis and Design with UML Version 2.0—An Object-Oriented Approach, 3nd edition, John Wiley & Sons. Inc., 2009

08Hrs

07Hrs

07Hrs



08Hrs

07Hrs

08Hrs





Reference Books

- 1. Object-Oriented Analysis and Design for Information Systems Modeling with UML, OCL, and IFML Raul Wazlawick, Morgan Kaufmann Publishers In; 1 edition
- 2. Object-oriented Information Systems Analysis and Design Using UML Simon Bennet, McGraw-Hill Publishing Co

Principles of Programming Languages

Course: M.Tech. (CS&E) Subject Code: 14MCSC153 Maximum Marks: 50

Semester: I **Contact Hours: 60** Credits: 4:0:0

Examination Question Paper Pattern

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

A programming language is a programmer's principal interface with the computer. As such, the choice of an appropriate language can make a large difference in a programmer's productivity. A major goal of this course is to present a comprehensive introduction to the principal features and overall design of both traditional and modern programming languages, how to precisely specify the dynamic behavior of programs in some language and methods for reasoning statically about the behavior of programs, particularly by specifying a type system for a language.

Course Objective

- Improve the background for choosing appropriate programming languages for certain classes of programming problems
- Increase the capacity to express programming concepts and choose among alternative ways to express things
- Be able in principle to design a new programming language and compare • programming languages;
- describe the main principles of imperative, functional, object oriented and logic oriented programming languages;

Unit -1

Preliminary Concepts: Reasons for studying, concepts of programming languages, Programming domains, Language Evaluation Criteria, influences on Language design, Language categories, Programming Paradigms - Imperative, Object Oriented, functional Programming , Logic Programming. Programming Language Implementation – Compilation and Virtual Machines, programming environments

Unit -2

Syntax and Semantics: general Problem of describing Syntax and Semantics, formal methods of describing syntax - BNF, EBNF for common programming languages features, parse trees, ambiguous grammars, attribute grammars, denotational semantics and axiomatic semantics for common programming language features

Unit -3

Data types: Introduction, primitive, character, user defined, array, associative, record, union, pointer and reference types, design and implementation uses related to these types.

PART – A

Dept. of CSE. SET-JU

08Hrs

08Hrs



Names, Variable, concept of binding, type checking, strong typing, type compatibility, named constants, variable initialization

Unit -4

Expressions and Statements: Arithmetic relational and Boolean expressions, Short circuit evaluation mixed mode assignment, Assignment Statements, Control Structures -Statement Level, Compound Statements, Selection, Iteration, Unconditional Statements, guarded commands.

PART - B

Unit -5

08Hrs Subprograms and Blocks: Fundamentals of sub-programs, Scope and lifetime of variable, static and dynamic scope, Design issues of subprograms and operations, local referencing environments, parameter passing methods, overloaded sub-programs, generic subprograms, parameters that are sub-program names, design issues for functions user defined overloaded operators, co routines.

Unit -6

Abstract Data types: Abstractions and encapsulation, introductions to data abstraction, design issues, language examples, C++ parameterized ADT, object oriented programming in small talk, C++, Java, C#, Ada 95 Concurrency: Subprogram level concurrency, semaphores, monitors, massage passing, Java threads, C# threads

Unit -7

Exception handling: Exceptions, exception Propagation, Exception handler in Ada, C++ and Java. Logic Programming Language: Introduction and overview of logic programming, basic elements of prolog, application of logic programming

Unit -8

Functional Programming Languages: Introduction, fundamentals of FPL, LISP, ML, Haskell, application of Functional Programming Languages and comparison of functional and imperative Languages. Scripting Language: Pragmatics, Key Concepts, Case Study: Python - Values and Types, Variables, Storage and Control, Bindings and Scope, Procedural Abstraction, Data Abstraction, Separate Compilation, Module Library

Text Books

- 1. Concepts of Programming Languages Robert .W. Sebesta 8/e, Pearson Education, 2008.
- 2. Programming Language Design Concepts, D. A. Watt, Wiley dreamtech, rp-2007

Reference Books

- 1. Programming Languages, 2nd Edition, A.B. Tucker, R.E. Noonan, TMH
- 2. Programming Languages, K. C.Louden, 2nd Edition, Thomson, 2003.
- 3. LISP, Patric Henry Winston and Paul Horn, Pearson Education.
- 4. Programming in Prolog, W.F. Clocksin & C.S.Mellish, 5th Edition, Springer.

07Hrs

07Hrs

07Hrs



Neural Networks

Course: M.Tech.(CS&E) Subject Code: 14MCSC154 Maximum Marks: 50

Semester: I **Contact Hours: 60** Credits: 4:0:0

Examination Question Paper Pattern

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- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

The goal of neural networks is to realize an artificial intelligent system using the human brain as the model. This course introduces the fundamental concepts behind neural networks, the biological motivation for their design, the practical developments that led to their evolution over time, and the mathematical basis for their applicability to problem solving domains and compare it's inherent problem solving capabilities to several other techniques .It helps to know how to use neural networks for solving different problems related to pattern recognition, function approximation and data visualization.

Course Objective

- Describe appropriate applications of neural networks and learning methods.
- Compare neural network solutions to other methods of modeling, approximation, simulation, classification, pattern recognition and decision making.
- Determine which methods of learning are appropriate for a given problem.
- Formulate and design neural networks and other learning systems to solve realistic applications.
- Measure the performance of the neural networks and other learning methods.

PART - A

Unit – 1

Introduction: What is a Neural Network?, Human Brain, Models of Neuron, Neural Networks viewed as directed graphs, Feedback, Network Architectures, Knowledge representation, Artificial Intelligence and Neural Networks.

Unit - 2

Learning Processes - 1: Introduction, Error-correction learning, Memory-based learning, Hebbian learning, Competitive learning, Boltzamann learning, Credit Assignment problem, Learning with a Teacher, Learning without a Teacher, Learning tasks, Memory, Adaptation.

Unit – 3

Learning Processes - 2, Single Layer Perceptrons: Statistical nature of the learning process, Statistical learning theory, Approximately correct model of learning.

Single Layer Perceptrons: Introduction, Adaptive filtering problem, Unconstrained optimization techniques, Linear least-squares filters, Least mean square algorithm, Learning curves, Learning rate annealing techniques, Perceptron, Perceptron convergence theorem, Relation between the Perceptron and Bayes classifier for a Gaussian environment.

08Hrs

07Hrs

Unit – 4

Multilayer Perceptrons - 1: Introduction, Some preliminaries, Back-propagation Algorithm, Summary of back-propagation algorithm, XOR problem, Heuristics for making the back-propagation algorithm perform better, Output representation and decision rule, Computer experiment, Feature detection, Back-propagation and differentiation.

PART -B

Multilayer Perceptrons - 2: Hessian matrix, Generalization, approximation of functions, Cross validation, Network pruning techniques, virtues and limitations. of back- propagation learning, Accelerated convergence of back propagation learning, Supervised learning viewed as an optimization problem, Convolution networks.

Unit – 6

Unit – 5

Radial-Basic Function Networks - 1: Introduction, Cover's theorem on the separability of patterns, Interpolation problem, Supervised learning as an ill-posed Hyper surface reconstruction problem, Regularization theory, Regularization networks, Generalized radial-basis function networks, XOR problem, Estimation of the regularization parameter.

Unit – 7

Radial-Basic Function Networks - 2, Optimization -1: Approximation properties of REF networks, Comparison of RBF networks and multilayer Perceptrons, Kernel regression and it's relation to RBF networks, Learning strategies, Computer experiment. Optimization using Hopfield networks: Traveling salesperson problem, Solving simultaneous linear equations, Al10cating documents to multiprocessors.

Unit – 8

Optimization Methods - 2: Iterated gradient descent. Simulated Annealing, Random Search, Evolutionary computation- Evolutionary algorithms, Initialization, Termination criterion, Reproduction, Operators, Replacement, Schema theorem.

Text Books

1. Neural Networks: - A Comprehensive "undation – Simon Haykin, 2nd Edition, Pearson Education, 1996

Reference Books

1. Artificial Neural.Networks - Kishan Mehrotra, Chilkuri K. Mohan,Sanjay Ranka, Penram International Publishing, 1997.

2. Artificial Neural Networks - B.Yegnanarayana, PHI, 2001.

07Hrs

07Hrs

08Hrs

07Hrs





Computer Lab – I

Course: M.Tech. (CS&E) Subject Code: 14MCSC106L Maximum Marks: 50

Semester: I Contact Hours: 90 Credits: 0:0:6

Note: Use any Programming Language implement using Eclipse IDE

- 1. To perform various operations on Binary search tree.
- 2. To perform operations on AVL trees.
- 3. To perform various operations on B-tree.
- 4. To perform various operations on Fibonacci Heaps.
- 5. To implement Heap sort and show its time complexity.

MINI PROJECT:

Design and implement optimization algorithm for specific application using anyone algorithm design technique.

(The following tasks can be implemented on Oracle or any other suitable RDBMS with support for Object features)

1. Develop a database application to demonstrate storing and retrieving of BLOB and CLOB objects.

2. Develop a database application to demonstrate the representation of multi valued attributes, and the use of nested tables to represent complex objects. Write suitable queries to demonstrate their use.

3. Design and develop a suitable Student Database application. One of the attributes to be maintained is the attendance of a student in each subject for which he/she has enrolled. Using TRIGGERS, write active rules to do the following:

a) Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the Head of the Department concerned.

b) Whenever, the marks in an Internal Assessment Test are entered, check if the marks are less than 40%; if so, notify the Head of the Department concerned.

4. Design and develop a suitable Employee Database application. Use tcl commands to:

- a) Develop a query to grant all privileges of employees table
- b) Develop a query to grant some privileges of employees
- c) Develop a query to grant some privileges of employees
- d) Write a query to implement the save point

5. Design and develop a database for Multi-table queries

- a) Simple joins (no INNER JOIN)
- b) Aliasing tables
- c) Inner-joins (two and more (different) tables)
- d) Inner-recursive-joins (joining to itself)
- e) Outer-joins (restrictions as part of the WHERE and ON clauses)



MINI PROJECT:

Design, develop, and execute a program in a java language of your choice to implement any one algorithm for mining association rules. Run the program against any large database available in the public domain and discuss the results.

Parallel Computer Architecture and Programming

Course: M.Tech. (CS&E) Subject Code: 14MCSC201 Maximum Marks: 50 Semester: II Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

From smart phones, to multi-core CPUs and GPUs, to the world's largest supercomputers, parallel processing is ubiquitous in modern computing. The goal of this course is to provide a deep understanding of the fundamental principles and engineering trade-offs involved in designing modern parallel computers as well as the programming techniques to effectively utilize these machines. Because writing good parallel programs requires understanding of key machine performance characteristics, this course will cover both parallel hardware and software design. Course programming assignments will be implemented in a number of modern environments including ISPC, OpenCL, OpenMP, and MPI.

Course Objective

- To get familiarize with parallel computer models.
- To learn about program and network properties.
- To understand different processor families and memory hierarchy.
- To learn about bus architecture and problems of multiprocessor systems.
- To get familiar with software for parallel programming.
- To understand parallel program environments.

PART - A

Parallel Computer Models: The State of Computing. Multiprocessors & Multicomputers. Multivector and SIMD Computers. PRAM & VLSI Models.

Unit – 2

Unit – 1

Program and Network Properties: Conditions of Parallelism. Program Partitioning and Scheduling. Program Flow Mechanisms. System Interconnect Architectures.

Unit – 3

Processors and Memory Hierarchy: Advanced processor technology. Superscalar and Vector processors. Memory hierarchy technology. Virtual memory technology.

07Hrs

08Hrs

M.Tech in Computer Science and Engg.

Unit – 4

Bus, Cache and Shared Memory: Backplane bus systems. Cache memory organizations. Shared memory organizations.

PART-B

Unit – 5

Pipelining and Superscalar Techniques: Linear Pipeline Processors. Non-linear processors. Instruction pipeline design. Arithmetic pipeline design.

Unit – 6

Multiprocessors and Multicomputers: Cache coherence and synchronization mechanisms. Message passing mechanisms.

Unit – 7

Software for Parallel Programming: Parallel Programming Models. Parallel Languages and Compilers. Dependence Analysis of Data Arrays. Code Optimization and Scheduling.

Unit – 8

Parallel Program Environments: Parallel Programming Environments. Synchronization and Multiprocessing Modes.

Text Book

1. Advanced Computer Architecture, Kai Hwang. Advanced Computer Architecture – Parallelism, Scalability, Programmability. Tata McGraw-Hill 2001.

Reference Book

1. Hennessey and Patterson: "Computer Architecture A Quantitative Approach", 4th Edition, Elsevier, 2007.



08Hrs

07Hrs

08Hrs

08Hrs

Computer Networks and Distributed Systems

Course: M.Tech. (CS&E) Subject Code: 14MCSC202 Maximum Marks: 50

Semester: II Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

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- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

The main goal of this course is to introduce the concepts of data communication and computer networks, to understand the distributed environment in complex application and the principles of the design, implementation of distributed systems. It makes available the steps and tools that enables to make proper and accurate decision about data transmission and computer systems connectivity.

Course Objective

- Describes various components, data communication and computer networking.
- Differentiate between different types of computer networks technologies and protocols.
- Describes LAN, Data Link Layer switching and explains the routing concepts.
- Describes the whole concept/idea behind network security as well as the various network/data security algorithms.

PART - A

Unit- 1

Review of Basic Network Architectures: OSI reference model, TCP/IP reference model, Applications (WWW, Audio/Video Streaming, Video conference, Client/Server); Dial Up Modem, DSL, Cable Television Networking – CATV –

Unit- 2

08Hrs

09Hrs

06Hrs

07Hrs

Internetworking IPv4 and IPv6, ICMP, IGMP, Network layer – Routing, Delivery, Forwarding.

Unit -3

Process to Process Delivery – UDP, TCP and SCTP, Congestion Control and Quality of Service.

Unit- 4

Applications and Other Networking Technologies: RTP, RTSP, SIP, VoIP, IPSEC, SSL / TLS, Introduction to Cellular telephony and Satellite Networks.

PART - B

Unit- 5

Characterization of Distributed Systems- Introduction, Examples of Distributed systems, Resource sharing and web, challenges. System models- Introduction, Architectural and Fundamental models.

Unit- 6

Interprocess Communication: API for Internet protocols. External data representation and Marshalling. Client-Server communication and Group communication. Distributed Objects and Remote Invocation: Communication between distributed objects, Remote Procedure Call, Events and notification.

Unit- 7

Peer to Peer Systems-Introduction, Peer to Peer middleware, Routing overlays Coordination and Agreement - Introduction, Distributed mutual exclusion, Elections.

Unit- 8

Transactions and Concurrency control - Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency controls.

Text Book

1. Behrouz A. Forouzan, Data Communications and Networking, Fourth Ed., Tata McGraw Hill, 2006.

Reference Books

1. Larry L. Peterson and Bruce S. Davie, Computer Networks: A Systems Approach, Fourth Ed., Morgan Kaufmann, 2007.

2. Distributed Systems: Concepts and Design - George Coulouris, Jean Dollimore, and Tim Kindberg.

3.Introduction to Reliable Distributed Programming - Rachid Guerraoui and Louis Rodrigues, Springer-Verlag, Berlin, Germany, 2006.



07Hrs

07Hrs

09Hrs

Cloud Computing

Course: M.Tech. (CS&E) Subject Code: 14MCSC203 Maximum Marks: 50

Semester: II Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

PAIN UNIVERSITY

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

The course is aimed towards providing students with the comprehensive and indepth knowledge of Cloud Computing concepts, technologies, architecture and applications by introducing and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications and implementations.

Course Objective

- To articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
- To identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud and hybrid cloud.
- To explain the core issues of cloud computing such as security, privacy, and interoperability.
- To provide the appropriate cloud computing solutions and recommendations according to the applications use.

PART - A

Unit– 1

Introduction : Defining Cloud Computing, Cloud Types, The NIST model, Deployment models, Service models, Examining the Characteristics of Cloud Computing, Paradigm shift, Benefits of cloud computing, Disadvantages of cloud computing, Assessing the Role of Open Standards, Early adopters and new applications, Cloud computing obstacles, Behavioral factors relating to cloud adoption, Measuring cloud computing costs, Avoiding Capital Expenditures, Right-sizing, Computing the Total Cost of Ownership, Specifying Service Level Agreements

Unit- 2

Understanding Cloud Architecture: Exploring the Cloud Computing Stack, Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols, Applications, Connecting to the Cloud .Understanding Services and Applications: Defining Infrastructure as a Service (IaaS), Defining Platform as a Service (PaaS), Defining Software as a Service (SaaS), Defining Identity as a Service (IDaaS), Defining Compliance as a Service (CaaS)

Unit– 3

Understanding Abstraction and Virtualization: Using Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Understanding Machine Imaging, Porting Applications, Capacity Planning: Capacity Planning, Defining Baseline and Metrics, Network Capacity, Scaling.

07Hrs

08Hrs

07Hrs

08Hrs

07Hrs

Unit-4

Cloud Computing Software Security Fundamentals: Cloud Information Security Objectives, Cloud Security Services, Relevant Cloud Security Design Principles, Secure Cloud Software Requirements, Cloud Computing Risk Issues: The CIA Triad, Privacy and Compliance Risks, Threats to Infrastructure, Data, and Access, Cloud Service Provider Risks.

PART – B

Unit- 5 08Hrs Cloud Security Fundamentals and Challenges: Architectural Considerations- General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Identity Management and Access control Identity management, Access control, Autonomic Security, Virtualization security management, Virtual threats, VM Security Recommendations, VM-Specific Security techniques.

Unit-6

Moving Applications to the Cloud: Applications in the Clouds, Functionality mapping, Application attributes, Cloud service attributes, System abstraction, Cloud bursting, Applications and Cloud APIs .Working with Cloud-Based Storage: Measuring the Digital Universe, Cloud storage in the Digital Universe, Cloud storage definition, Provisioning Cloud Storage, Unmanaged cloud storage, Managed cloud storage, Creating cloud storage systems, Virtual storage containers, Exploring Cloud Backup Solutions, Backup types, Cloud backup features, Cloud attached backup, Cloud Storage Interoperability.

Unit-7

Working with Mobile Devices: Defining the Mobile Market, Connecting to the cloud, Adopting mobile cloud applications, Feature phones and the cloud, Using Smart phones with the Cloud, Android, AppStore, Working with Mobile Web Services: Understanding Service Types, Mobile interoperability, Performing Service Discovery, Context-aware services, MEMS, Location awareness, Push services, Using SMS, Defining WAP and Other Protocols, Performing Synchronization

Unit-8

07Hrs Using Google Web Services: Exploring Google Applications, Surveying the Google Application Portfolio, Indexed search, Productivity applications and services, Enterprise offerings, AdWords, Google Analytics, Google Translate, The Google APIs, Working with the Google App Engine ,Understanding Amazon Web Services: Amazon Web Service Components and Services, Understanding Amazon Database Services, Amazon SimpleDB, Amazon Relational Database Service (RDS), Choosing a database for AWS., Exploring Microsoft Cloud Services: Defining the Windows Azure Platform, The software plus services approach, The Azure Platform, The Windows Azure service, Windows Azure AppFabric, Azure Content Delivery Network, SQL Azure , Windows Azure pricing, Windows Live services





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Text Books

- 1. Cloud Computing Bible by Barrie Sosinsky, Wiley India
- 2. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

Reference Books

- 1. Cloud Computing For Dummies Hurwitz , Robin Bloor , Marcia Kaufman , Fern Halper, Wiley India Edition.
- 2. Cloud Security and Privacy Tim Mather, Subra Kumaraswamy, Shahed Latif , Publisher: O'Reilly Media

Design Patterns

Course: M.Tech. (CS&E) Subject Code: 14MCSC204 Maximum Marks: 50 Semester: II Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

This course builds upon the basic programming techniques learned in other courses and introduces students to tools at the design level. Design patterns, and code reuse strategies as well as the Unified Modeling Language, and other diagrammatic techniques for planning and design will be explored.

Course Objective

- To identify the purpose and methods of use of common object-oriented design patterns
- To select and apply these patterns in their own designs for simple programs
- To represent the data dependencies of a simple program using UML
- To learn why patterns are an important communication and design tool, and how to apply the appropriate patterns for a given design

PART - A

Unit– 1

Design Patterns: Origin and History, Architectural to Software Design Patterns, What Is a Design Pattern? More about Design Patterns. Introduction to UML: Structure Diagrams, Behavior Diagrams, Model Management Diagrams, Class Diagrams, Sequence Diagrams.

Unit- 2

Creational Patterns: Factory Method, Singleton, Abstract Factory, Prototype, Builder.

Unit- 3

Collectional: Composite, Iterator, Flyweight, Visitor.

Unit- 4	07Hrs

08Hrs

07Hrs

Concurrency: Critical Section, Consistent Lock Order, Guarded Suspension, Read-Write Lock.

PART - B

Unit- 5

Structural - I: Decorator, Adapter, Chain of Responsibility, Facade, Proxy, Bridge.

Unit– 6

Structural - II: Virtual Proxy, Counting Proxy, Aggregate Enforcer, Explicit Object Release, Object Cache.

Unit– 7

Behavioral - I: Command, Mediator, Memento, Observer, Interpreter, State, Strategy, Null Object.

Unit– 8

System Patterns: Introduction to System Patterns, Model-View-Controller (MVC), Session, Worker Thread, Callback, Successive Update, Transaction.

Text Books

1. Software Architecture Design Patterns in Java, Partha Kuchana, Auerbach Publications, 2004

2. Applied Java[™] Patterns, Stephen Stelting & Olav Maassen, Prentice Hall, 2001, First Edition

Reference Books

- 1. Java Design Patterns, James W. Cooper Addison-Wesley Professional publication, 2000
- 2. Design Patterns in Java (Software Patterns Series), by Steven John Metsker (Author), William C. Wake (Author), Addison Wesley publication; 2 edition

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07Hrs

08Hrs

07Hrs

Advanced Java and J2EE

Course: M.Tech. (CS&E) Subject Code: 14MCSC251 Maximum Marks: 50

Semester: II **Contact Hours: 60** Credits: 4:0:0

Examination Question Paper Pattern

I**N** UNIVERSITY eclared as Deemed-to-be University u/s 3 of the UGC Act.1

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

This course covers advanced object oriented techniques with Java. It is an extremely practical course, Java-with its platform independence-is heavily used in Web applications and middleware that work on Windows, Macintosh, UNIX and other platforms. Examine fundamental programming concepts, and get an introduction to object-oriented programming. Upon successful completion of the course, you are able to write simple applications and are prepared for courses that assume some familiarity with Java.

Course Objective

Upon completion of this course, students will be able to

- comprehend the art of programming and, in particular, the structure and meaning of basic Java programs,
- Design and build programs using problem-solving techniques such as top-down design.
- Modify, compile, debug, and execute Java programs, understand how to create graphical interfaces and Java applets for a Web page.
- Gain competence in Java's component model Java Beans learns how to dynamically invoke and configure components.
- Develop essential skills to migrate components to a distributed environment know the pitfalls and solutions of distributed and concurrent programming be able to use relevant Java design patterns and idioms to solve common problems.

PAR-T A

Unit-1

Brief history of Java and Fundamentals of J2EE: History of programming languages, The Beginning of Java, core java concepts, Advantages of Java, J2EE & J2SE, Web server.

Unit-2

Java Servlets: Fundamentals of servlet, Java Servlets & CGI, A simple Java Servlet, Servlet life cycle, Handling GET & POST requests, Request & Response headers, Servlet redirect Vs request dispatcher, Init parameters, ServletCofig & ServletContext.

Unit-3

Java Servlets: Working with transactions, working with cookies, Sessions.

Unit-4

Java Server Pages: Fundamentals of JSP, JSP Tags, JSP expressions, variables & description, Lifecycle of JSP. Making JSP dynamic: Standard actions, Expression Language, JSTL.

28 / 49

08Hrs

08Hrs

07Hrs

PART- B

Unit- 5 JDBC & Database: A fundamental OO feature, Concept of JDBC, JDBC Driver types, Establishing JDBC connection, Statement Object, ResultSet Object, RowSet Object, Database Tables, Indexing, Database operations – Select, Update, insert & delete.

Unit- 6

Web application architecture, Framework & Deployment: J2EE application structure, Web application architecture, MVC Framework, Web application Deployment.

J2EE Design Patterns: Design Patterns concept, Different design patterns.

Unit- 7

EJB, JavaMail & Java RMI: EJB concept, JavaMail concept, Java RMI concept.

Unit- 8

JMS, JNDI & Web services JMS concept, JNDI concept, Web service concepts.

Text Books

1. J2EE: The Complete Reference by James Edward Keogh published in 2002

Reference Books

- 1. J2EE: The Complete Reference by James Edward Keogh published in 2002
- 2. Head First Servlets and JSP by Bert Bates, Kathy Sierra



08Hrs

07Hrs

Real Time Embedded Systems

Course: M.Tech. (CS&E) Subject Code: 14MCSC252 Maximum Marks: 50

Semester: II Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

This project-oriented course focuses on the use of embedded software (ES) development paradigms for generating ES-specific testing processes. Topics include component-based (unit) development and testing; a mapping of embedded software (characteristics) into testing techniques (measures) in the context of the (embedded) software lifecycle, infrastructure (environment/tools), techniques (approaches), and testing organization (people); and methods for classifying ES for selecting suitable testing contexts; and the impact or constraints due to the embedded operating systems, hardware, memory, tools, and related protocols.

Course Project: The course includes a project that focuses on developing a testing suite and/or a case-study of an embedded system, considering its design, implementation, testing, and simulation/deployment.

Course Objective

Upon completion of this course, students will be able to

- Student will be able to identify key component parts of an ES, differentiating the ES itself from the environment it controls, its interfaces, and the component testing and integration of the parts
- Students will be able to integrate into the testing process various OS, hardware, timing, and programming language considerations or characteristics
- Students will be able to evaluate or validate their capabilities via realistic semester projects

PART -A

Unit– 1

Introduction to Embedded Systems: Embedded systems; Processor embedded into a system; embedded hardware Units and devices in a system; embedded software in a system; Examples of embedded systems; Complex systems design and processors; Design process in embedded system. Categories of Embedded Systems-Specifications of Embedded systems-Resent trends in Embedded Systems-Hardware Architecture-Software Architecture.

Unit- 2

ARM -32 bit Microcontroller family. Architecture of ARM Cortex M3- General Purpose Registers, Stack Pointer, Link Register, Program Counter, Special Register. Nested Vector Interrupt Controller. Interrupt behavior if ARM Cortex M3. Exceptions Programming. Advanced Programming Features. Memory Protection. Debug Architecture.

Unit-3

RFID Technology Introduction. Automatic identification systems. The components of an RFID system. The different types of RFID systems. RF ranges. Information security.

07Hrs

08Hrs

30 / 49

08Hrs

JAIN UNIVERSITY Declared as Deemed-to-be University u/s 3 of the UGC Act, 1956 Standards in force Examples of implementations, Conclusion.

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Unit-4

Communication Buses For Device Networks: Wireless devices; Timer and counting devices; Watchdog timer; Real time clock; Networked embedded systems; Serial bus communication protocols; Parallel bus device protocols; Internet enabled systems; Wireless and mobile system protocols.

PART- B

Unit-5

Embedded Programming: Software programming in assembly language (ALP) and in high level language 'C', 'C' programming elements: header and source files and preprocessor directives, program elements : macros and functions, Program elements : data types, data structures, modifiers, statements, loops and pointers, Objected oriented programming, Embedded programming in Java, Optimization of Memory needs.

Unit- 6

08Hrs Real Time Operating Systems: Inter Process Communication and Synchronization of Processes, Task And Threads: Multiple processes in an application, multiple threads in an applications, Task Tasks and states, Tasks and data. Concept of semaphores, Shared data, Inter process communications Signals, Semaphores, Message queues, Mailboxes, Pipes, Sockets, Remote procedure calls.

Unit-7

Embedded Software Development, Tools: Introduction; Host and target machines; Linking and locating software; Getting embedded software in to the target system; Issues in hardware-software design; Testing on host machine; Simulators; Laboratory tools.

Unit-8

Real-Time Operating System Tools and Case Studies. Use of µC/OS-II- Case study of coding for an Automatic Chocolate Vending Machine using MUCOS RTOS, Case study of an Embedded system for an Adaptive Cruise Control Systems in a Car, Case study of an Embedded Systems for a Smart Card.

Text Books

1. Embedded Systems Architecture: Programming and Design – Rajkamal, 2nd Edition, Tata McGraw Hill, 2008.

2. Joseph Yiu "The Definitive Guide to the ARM Cortex,-M3, Newnes, (Elsevier), 2008.

Reference Books

1. Computers as Components: Principles of Embedded Computer System Design -Wayne Wolf, Elsevier, 2005.

2. Embedded Systems Architecture – Tammy Noergaard, Elsevier, 2005.

3. Embedded Systems Design – Steve Heath, 2nd Edition, Elsevier, 2003.

4. Embedded/Real-Time Systems: Concepts, Design and Programming: The Ultimate Reference – Dr. K.V.K.K. Prasad, Dreamtech Press, 2004.

5. Embedded C – Michael J.Point, Pearson Education, 2002.



07Hrs

08Hrs

07Hrs



6. An embedded Software Primer by David E Simon, Pearson Edition 1999.

7. "Computer Organization and Design" (ARM Edition), David Patterson and John L. Henessay, Morgan Kauffman.

Data Mining and Data Warehousing

Course: M.Tech. (CS&E) Subject Code: 14MCSC253 Maximum Marks: 50 Semester: II Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

Data Mining studies algorithms and computational paradigms that allow computers to find patterns and regularities in databases, perform prediction and forecasting, and generally improve their performance through interaction with data. It is currently regarded as the key element of a more general process called Knowledge Discovery that deals with extracting useful knowledge from raw data. The knowledge discovery process includes data selection, cleaning, coding, using different learning techniques, and visualization of the generated structures

Learning outcome:

Course Objective

- Understanding the fundamental theories and concepts of Data warehouse and Data mining
- Designing of dimensional modeling
- Conduct data extraction, transformation loading (ETL) and OLAP
- Implementing various Data mining Techniques to various domain data to predict hidden pattern

PART-A

Unit-1

Introduction to KDD process – Knowledge Discovery from Databases - Need for Data Preprocessing – Data Cleaning

Unit-2

Introduction - Data Mining Functionalities - Association Rule Mining - Mining Frequent Item sets with and without Candidate Generation - Mining Various Kinds of Association Rules - Constraint-Based Association Mining.

Unit-3

08Hrs

07Hrs

08Hrs

Classification vs. Prediction – Data preparation for Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification.

Unit-4

Classification by Back Propagation - Support Vector Machines - Associative Classification -Lazy Learners - Other Classification Methods - Prediction - Accuracy and Error Measures -Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.28

PART-B

Cluster Analysis - Types of Data in Cluster Analysis - A Categorization of Major Clustering Methods - Partitioning Methods - Hierarchical methods - Density-Based Methods - Grid-Based Methods.

Unit -6

Unit-5

Data Warehousing - Operational Database Systems vs. Data Warehouses Data Warehouse Architecture concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema.

Unit -7

Multidimensional Data Model – Schemas for Multidimensional Databases OLAP Operations – Indexing – OLAP queries & Tools.

Unit-8

Model-Based Clustering Methods - Clustering High- Dimensional Data - Constraint-Based Cluster Analysis – Outlier Analysis.

Text Books

- 1. Data Mining Concepts and Techniques Jiawei Han & Micheline Kamber, Morgan KaufmannPublishers,Elsevier,2ndEdition,2006.
- 2. Introduction to Data Mining Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education.

Reference Books

1. Data Mining Techniques – Arun K Pujari, 2nd edition, Universities Press

2. Data Warehousing in the Real World – Sam Aanhory & Dennis Murray Pearson Edn Asia

3. Insight into Data Mining, K.P.Soman, S.Diwakar, V.Ajay, PHI, 2008.

4. Data Warehousing Fundamentals – Paulraj Ponnaiah Wiley student Edition



07Hrs

08Hrs

08Hrs

07Hrs

M.Tech in Computer Science and Engg.

Course: M.Tech. (CS&E) Subject Code: 14MCSC254 Maximum Marks: 50

Semester: II **Contact Hours: 60** Credits: 4:0:0

Examination Question Paper Pattern

1. All questions carry equal marks.

2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

The subject provides the basic knowledge of Web Technologies and insight into E-Commerce. The subject provides introduction to web services and also implementation details. The course main concentrates on some scripting languages like perl, php and interaction with databases.

Course Objective

- To understand Web programming languages and implementation.
- To understand the SOA, its Principles and Benefits
- To understand XML concepts and Web Services.
- To understand paradigms needed for testing Web Services.
- To implement functional testing, compliance testing and load testing of Web Services
- To understand the basic of E-Commerce

PART-A

Unit -1

Programming in Perl :Origins and uses of Perl, Scalars and their operations, Assignment statements and simple input and output, Control statements, Fundamentals of arrays, Hashes, References, Functions, Pattern matching, File input and output; Examples.

Unit -2

CGI Scripting: Developing CGI Applications, Processing CGI, Introduction to CGI.pm, CGI.pm methods, Creating HTML P a g e s D y n a m i c a l l y , U s i n g C G I . pm - A n E x a mp I e , A d d i n g Robustness, Carp, Cookies, Uploading files, Tracking users with Hidden Data, Using Relational Databases.

Unit-3

Introduction to PHP: Origins and uses of PHP, Overview of PHP, General syntactic characteristics, Primitives, operations and expressions, Output, Control statements, Arrays, Functions, Pattern matching, Form handling, Files, Tracking users, cookies, sessions, Using Databases, Handling XML.

Unit-4

Introduction to XML: Introduction, Syntax, Document structure, Document type definitions, Namespaces, XML schemas, Displaying raw XML documents, Displaying XML documents with CSS, XSLT style sheets, XML processors, Web services.

34 / 49

07Hrs

07Hrs

08Hrs



PART-B

Unit- 5

Client side scripting using Java Script and Validations - Document Object Model (DOM) Introduction to Frameworks – Introduction to POJO – Multithreaded Programming – Java I/O – Java Database Connectivity (JDBC).

Unit- 6

Introduction web 2.0: What is Web 2.0?, Folksonomies and Web 2.0, Software As a Service (SaaS), Data and Web 2.0, Convergence, Iterative development, Rich User experience, Multiple Delivery Channels, Social Networking.

Unit -7

Web Services: Web Services: SOAP, RPC Style SOAP, Document style SOAP, WSDL, REST services, JSON format, What is JSON?, Array literals, Object literals, Mixing literals, JSON 0053yntax, JSON Encoding and Decoding, JSON versus XML.

Unit- 8

Introduction: E-Commerce: Overview of E-Commerce, Benefits of E-Commerce, Impact of E-Commerce, Applications of E-Commerce, Business Models of E-Commerce. Electronic Payment System: Introduction to Payment System, Online Payment System, Pre-paid and Post-paid Payment System. Security in E-Commerce: Transaction Security, Cryptology, Authentication Protocol, Digital Signature.

Text Books

1. Chris Bates: Web Programming Building Internet Applications, 3rd Edn, Wiley India, 2006

2. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2008

3. Francis Shanahan: Mashups, Wiley India 2007

4. P.T. Joseph: E-Commerce - A Managerial Perspective, PHI Publication.

Reference Books

1. M. Deitel, P.J. Deitel, A. B. Goldberg: Internet & World Wide Web How to H program,

3rdEdition, Pearson Education / PHI, 2004.

- 2. Xue Bai et al: The Web Warrior Guide to Web Programming, Thomson, 2003.
- 3. Joel Murach's PHP and MySQL. Mauch's Publications, First Edition.
- 4. Jeffery: Introduction to E-Commerce, TMH



07Hrs

07Hrs

08Hrs



Computer Lab - II

Course: M.Tech. (CS&E) Subject Code: 14MCSC206L Maximum Marks: 50

Semester: II Contact Hours: 90 Credits: 0:0:6

- 1. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for FCFS and SJF. For each of the scheduling policies, compute and print the average waiting time and average turnaround time. (2 sessions)
- 2. Given the list of processes, their CPU burst times and arrival times, display/print the Gantt chart for Priority and Round robin. For each of the scheduling policies, compute and print the average waiting time and average turnaround time. (2 sessions)
- 3. Developing Application using Inter Process Communication (using shared memory, pipes or message queues)
- 4. Implement the Producer Consumer problem using semaphores (using UNIX system calls).

Mini Project:

File System:

- 1. To understand how file systems work, specifically the directory hierarchy and storage management.
- 2. To understand some of the performance issues file systems deal with.
- 1. Identifying well known ports on a Remote System:

By trying to listen to the various well known ports by opening client connections. If the exception does not occur then the remote port is active else the remote port is inactive.

2. Writing a Chat application:

i). One-One: By opening socket connection and displaying what is written by one party to the other.

ii). Many-Many (Broad cast): Each client opens a socket connection to the chat server and writes to the socket. Whatever is written by one party can be seen by all other parties.

3. Data retrieval from a Remote database:

At the remote database a server listens for client connections. This server accepts SQL queries from the client, executes it on the database and sends the response to the client.

a) You are an employee of an XYZ company, working in its branch office and have been given the task to provide service for a valued enterprise customer. If you are unable to solve queries of the customer, obtain the help from your boss at headquarters. The nodes are installed at three different locations. One is at the customer's headquarters, one is at their branch office and one is at a top secret R&D department. Implement the above scenario using TCP socket.

b) Develop a Client/server application in any language for implementing the following scenario:

Consider nodes A, B, C and D. Visualize Node A as the source, node B as the router. Nodes C and D are two nodes acting as two different networks connected with two interfaces of the router B. Node A should send an IP datagram to B. B extracts



the network address from the destination IP of the datagram and forwards it to either C or D depending on the network address.

Note: Construct IP header with proper fields. Use a static routing table in node B and suitable subnet masks for forwarding to C and D. Show the output for both Cases

Case 1: IP datagram to node C.

Case 2: IP datagram to node D.

c) Simulation of DNS using UDP sockets. Consider a root server, three Top Level Domain (TLD) servers (say, corresponding to com, edu and gov), three Authoritative Servers. The client sends a DNS query to the root server. The root server sends the IP address of TLD server to the client. The client sends the DNS query to the TLD server. The TLD server sends the IP address of the authoritative server to the client. The client sends the DNS query to the authoritative server and gets the IP address of the required host. Implement this scenarios in any language.

Note: A domain name consists of one or more parts, technically called labels. Each label may contain up to 63 characters. The full domain name may not exceed a total length of 253 characters. The characters allowed in a label follow the LDH rule (letters, digits, hyphen). Domain names are interpreted in case- independent manner. Labels should not start or end with a hyphen

4. Write a code in TCP protocol stack, which sends a SYN packet with a randomly spoofed IP to avoid the firewall blocking. This will result in all the entries in the spoofed IP list, sending RST segments to the victim server, upon getting the SYN-ACK from the victim. This can choke the target server and often form a crucial part of a Denial Of Service (DOS) attack. Launch the DOS attack by many hosts from various location, all target the same victim to launch Distributed DOS (DDOS).

5. Simulation of FTP – understanding control and data channels. The client initiates a TCP connection to the server and sends the required FTP command to the server. For example, "get filename". The server reads the command, initiates a new TCP connection with the client using a different port number. The server then sends the result of the command to the client and closes the connection.

MINI PROJECT:

Use the packet capturing tool and measure the traffic from each node in a application wise, and pair wise traffic application

Software Testing

Course: M.Tech. (CS&E) Subject Code: 14MCSC301 Maximum Marks: 50

Semester: III Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

PAIN UNIVERSITY

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

The student should develop the basic skills in software testing by implementing various strategies of software testing in their project. They need to bring out the ways and means of controlling and monitoring testing activity.

Course Objective

- The students learn to apply the testing strategies and methodologies in their projects.
- To understand test management strategies and tools for testing.

PART – A

Unit– 1

Basics of Software Testing and Examples: Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized Pseusdocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem. Decision Table-Based Testing: Decision tables, Test cases for the triangle problem, Test cases for the NextDate function, Test cases for the NextDate function.

Unit– 2

Data Flow Testing: Definition-Use testing, Slice-based testing, Guidelines and observations. Levels of Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, separating integration and system testing.

Unit– 3

Integration Testing: A closer look at the SATM system, Decomposition-based, call graph based, Path-based integrations, Case study. System Testing: Threads, Basic concepts for requirements specification, Finding threads, Structural strategies and functional strategies for thread testing, SATM test threads, System testing guidelines, ASF (Atomic System Functions) testing example.

Unit- 4

Interaction Testing: Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing Issues in Object-Oriented Testing: Units for object-oriented testing, Implications of composition and encapsulation, inheritance, and polymorphism, Levels of object-oriented testing, GUI testing, Dataflow testing for object-oriented software, Examples.

08Hrs

07Hrs

08Hrs

PART – B

08Hrs Class Testing: Methods as Units, Classes as Units Object-Oriented Integration Testing: UML support for integration testing, MM-paths for object-oriented software, A framework for object-oriented dataflow integration testing.

Unit-6

GUI Testing: The currency conversion program, Unit testing, Integration Testing and System testing for the currency conversion program Object-Oriented System Testing: Currency converter UML description, UML-based system testing, State chart-based system testing.

Unit-7

Exploratory Testing: The context-driven school, Exploring exploratory testing, Exploring a familiar example, Exploratory and context-driven testing observations Model-Based Testing: Testing based on models, Appropriate models, Use case-based testing, Commercial tool support for model-based testing.

Unit-8

Test-Driven Development: Test-then-code cycles, Automated test execution, Java and JUnitexample, Remaining questions, Pros, cons, and open questions of TDD, Retrospective on MDD versus TDD Closer Look at All Pairs Testing: The all-pairs technique, A closer look at NIST study, Appropriate applications for all pairs testing, Recommendations for all pairs testing Software Testing Excellence: Craftsmanship, Best practice of software testing.

Text Books

1. Paul C. Jorgensen: Software Testing, A Craftsman's Approach, 3rd Edition, Auerbach Publications, 2008

Reference Books

1. Aditya P Mathur: Foundations of Software Testing, Pearson, 2008.

2. Mauro Pezze, Michal Young: Software Testing and Analysis - Process, Principles and Techniques, John Wiley & Sons, 2008

3. Srinivasan Desikan, Gopalaswamy Ramesh: Software testing Principles and Practices, 2nd Edition, Pearson, 2007

Unit-5

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08Hrs

07Hrs

Android Applications Design

Course: M.Tech. (CS&E) Subject Code: 14MCSC302 Maximum Marks: 50

Semester: III Contact Hours: 60 Credits: 4:0:0

Examination Question Paper Pattern

JAIN UNIVERSITY

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

Provides an overview of Android as a development platform. It is the gentle introduction to the Android operating system and to take advantage of its uniqueness. Android is designed for a high-level understanding of the platform as well as for programming Android. By the end of this course, you will have a complete understanding of the entire operating system, at a high level.

Course Objective

- Familiarize with Mobile apps development aspects
- Design and develop mobile apps, using Android as development platform, with key focus on user experience design, native data handling and background tasks and notifications.
- Appreciation of nuances such as native hardware play, location awareness, graphics, and multimedia.
- Perform testing, signing, packaging and distribution of mobile apps.

Unit-1

Getting started with Mobility: Mobility landscape, Mobile platforms, Mobile apps development, Overview of Android platform, setting up the mobile app development environment along with an emulator, a case study on Mobile app development.

Unit- 2

Building blocks of mobile apps 1: App user interface designing – mobile UI resources (Layout, UI elements, Draw-able, Menu), Activity- states and life cycle, interaction amongst activities.

Unit -3

Building blocks of mobile apps 2: App functionality beyond user interface - Threads, Async task, Services – states and life cycle, Notifications, Broadcast receivers, Telephony and SMS APIs

Unit- 4

Dealing with Data: Native data handling – on-device file I/O, shared preferences, mobile databases such as SQLite, and enterprise data access (via Internet/Intranet)

PART - A

08Hrs

07Hrs

07Hrs

PART - B

Unit- 5

Sprucing up mobile apps 1: Graphics and animation – custom views, canvas, animation APIs, multimedia – audio/video playback and record, location awareness, and native hardware access (sensors such as accelerometer and gyroscope).

Unit- 6

Sprucing up mobile apps 2: Location awareness and native hardware access (sensors such as accelerometer and gyroscope).

Unit -7

Testing mobile apps: Debugging mobile apps, White box testing, Black box testing, and test automation of mobile apps, JUnitfor Android, Robotium, MonkeyTalk.

Unit- 8

Taking apps to Market: Versioning, signing and packaging mobile apps, distributing apps on mobile market place.

Text Books

1. Mobile Apps Development by Anubhav Pradhan, Anil V Deshpande , Edition I

Reference Books

1. Android Application Development All in one for Dummies by Barry Burd, Edition I

2. Teach Yourself Android Application Development In 24 **Hrs**, Edition I, SAMS Publication.



10Hrs

06Hrs

08Hrs

Business Intelligence

Course: M.Tech. (CS&E) Subject Code: 14MCSC331 Maximum Marks: 50

Semester: III **Contact Hours: 60** Credits: 4:0:0

Examination Question Paper Pattern

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- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

To provide knowledge in business analytics and business intelligence and the way it is implied in data warehousing and data mining by collecting, managing and interpreting data to solve issues and in improving decision making using the knowledge retrieved from database.

Course Objective

- Learning the need of business analytics and business intelligence.
- Use of business analytics in data warehousing and data mining architects.
- To learn the need for business intelligence and to implement Business intelligence in data mining.
- 4 Usage of business intelligence in data warehousing and data mining architects.
- Integration of Business intelligence with Data mining applications

PART-A

Unit -1

Introduction to Business Intelligence: Introduction to digital data and its types - structured, semi-structured and unstructured, Introduction to OLTP and OLAP (MOLAP, ROLAP, HOLAP), BI Definitions & Concepts, BI Framework.

Unit-2

Data Warehousing concepts and its role in BI, BI Infrastructure Components - BI Process, BI Technology, BI Roles & Responsibilities, Business Applications of BI, BI best practices

Unit-3

Basics of Data Integration: (Extraction Transformation Loading) Concepts of data integration, needs and advantages of using data integration, introduction to common data integration approaches, Meta data - types and sources,

Unit-4

Unit -5

Introduction to Data quality, data profiling concepts and applications, introduction to ETL using Pentaho data Integration (formerly Kettle)

PART-B

07Hrs

Introduction to Multi-Dimensional Data Modeling Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema,

42 / 49

08Hrs

07Hrs

08Hrs



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Unit - 6

Introduction to business metrics and KPIs, creating cubes using Microsoft Excel.

Unit - 7

08Hrs Fundamentals of data mining: Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept hierarchy.

Unit - 8

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining.

Text book

Fundamentals of Business Analytics by R N Prasad Seema Acharya.

Reference Books

1. Business Intelligence by David Loshin.

- 2. Business intelligence for the enterprise by Mike Biere.
- 3. Data Mining Concepts and Techniques Jiawei Han & Micheline Kamber,
- 4. Business Intelligence for Dummies Swain Scheps.

5. Successful Business Intelligence: Secrets to making Killer BI Applications by Cindi Howson.

6. Information dashboard design by Stephen Few.

08Hrs

Big Data Analytics

Course: M.Tech. (CS&E) Subject Code: 14MCSC332 Maximum Marks: 50

Semester: III **Contact Hours: 60** Credits: 4:0:0

Examination Question Paper Pattern

- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

This course provides practical foundation level training that enables immediate and effective participation in big data and other analytics projects. It includes an introduction to big data and the Data Analytics Lifecycle to address business challenges that leverage big data. The course provides grounding in basic and advanced analytic methods and an introduction to big data analytics technology and tools, including Map Reduce and Hadoop.

Course Objective

On successful completion of this course, the learner will be able to:

- Deploy the Data Analytics Lifecycle to address big data analytics projects
- Apply appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights that can lead to actionable results.
- Select appropriate data visualizations to clearly communicate analytic insights to business sponsors and analytic audiences 4. Use tools such as: R and R Studio, Map Reduce / Hadoop, in-database analytics, Window and MAD lib functions 5. Explain how advanced analytics can be leveraged to create competitive advantage and how the data scientist role and skills differ from those of a traditional business intelligence analyst.

PART - A

Unit-1

What is big data and why is it Important?

Unit- 2

Industry examples of Big Data-I.Digital ,marketing and non line world, Database marketers, pioneers of big data, Big data and the new school marketing, Fraud and big data, Risk and big data, Credit risk management.

Unit-3

Industry examples of Big Data-II.Big data and algorithm trading, Big data and advances in health care, Pioneering new frontiers in medicine, Advertising and big data: from papyrus to seeing somebody. Using consumer product as a doorway.

Unit – 4

Big data technology -I.Hadoop, old vs new approach, data discovery, open source technology for big data analytics, the cloud and big data, predictive analytics, software a service.

07Hrs

08Hrs

08Hrs

07Hrs

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M.Tech in Computer Science and Engg.

PART-B

Mobile business intelligence in going mainstream, crowd sourcing, inter and trans firewalls analytics, R&D approach helps adopt new technology, Big data technology turn.

Unit- 6

Unit-5

Information management, Big data foundation, big data platform, handle the big data analytics, Big data computation, more on big data storage, big data computational limitations, Big data emerging technologies.

Unit- 7

Business analytics, The last mile in data analytics, Geospatial intelligence will make your life better, Listening: is it signal or noise, Consumption of analytics, Consumption limitation, From creation to consumption, Visualizing: how to make it consumable.

Unit- 8

Rise of the data scientist, learning over knowing, agility, scale and convergence, multidisciplinary talent, innovation, cost effectiveness using deep math, science and cs, The 90/10 rule critical thinking, Analytical talent and executive talent, developing decision sciences talent, Holistic view of analytics, creating talent for decision sciences creating culture that nurtures decision science talents, Setting up the right organizational structure for institutionalizing analytics.

Text Book

Michael Minelli , Michele Chambers : Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses Hardcover, 1^{st} edition Wiley C/O series, 2013

Reference Books

1. Viktor Mayer-Schonberger, Kenneth Neil Cukier: Big Data: Arevolution That Will Transform How We Live Work and Think, 1st edition, Hachette India, 2013.



07Hrs

07Hrs

08Hrs

Network Forensics

Course: M.Tech. (CS&E) Subject Code: 14MCSC333 Maximum Marks: 50

Semester: III **Contact Hours: 60** Credits: 4:0:0

Examination Question Paper Pattern

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- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

Network forensics studies cyber-attack prevention, planning, detection, response, and investigation with the goals of counteracting cyber crimes, and making the responsible persons/groups accountable The knowledge of computer and network forensics has become essential in securing today's network-centric computing environment. The topics covered in this course include fundamentals of digital forensics, forensic duplication and analysis, network surveillance, intrusion detection and response, incident response, anti-forensics techniques, anonymity and pseudo anonymity, cyber law, computer security policies and guidelines. Upon completing this course, the students are expected to understand the basics of computer and network forensics, to be well-trained as next-generation computer crime investigators, and to be prepared for active research at the forefront of these areas.

Course Objective

- The knowledge of computer and network forensics has become essential in securing today's network-centric computing environment.
- This course will give the students both the fundamental knowledge and hands-• on practice on computer and network forensics.
- The added exposure to forensics will enhance student's skills and forward knowledge into their future careers.
- Provides to understand the basics of computer and network forensics.

PART - A

08Hrs

07Hrs

Introduction to Cyber forensics, Classifications of cyber forensics, CIA triad, AAA triad, Differences between Threat, Risk and Vulnerability, Introduction to Networking, CIDR (Classless Inter Domain Routing) Problems, and connectivity with Intra connecting devices.

Unit-2

Unit-1

Attacks on the topologies of a network, Understanding attacks on each layer of OSI model, Vulnerabilities of gateways and Demilitarized zone, Encryption on the network, layered approach of defense.

Unit-3

Intrusion Detection Systems: Types of Intrusion, Attack Patterns, Host/Network-Based Intrusion Detection, Placement of the IDS, Snort, Example Rules,

Unit-4

P2P Detection, MSN Messenger, Virus/Worm Detection, Sweeps, Running Snort, TCP Flags ,User, Machine, and Network Profiling, In-Line and Out-of-Line IDSs, False and True, Customized Agent-Based IDS

PART - B

Network Security Elements: Router, Packet Filtering, Firewalls, Standard ACLs, Extended ACLs, ACL Examples, Open and Closed Firewalls, Network Address Translation, PAT (Port Address Translation), NAT Types, NAT Backtracking, NAT Weaknesses, Configuring Dynamic NAT, Static Mapping, NAT Overloading, PIX/ASA Firewall, Proxy Servers.

Unit-6

Unit- 5

08Hrs Network Forensics: The Key Protocols, Ethernet, IP, and TCP Headers, TCP Connection, ARP, SYN, Application Layer Analysis-FTP, ICMP, DNS, Port Scan, SYN Flood, Spoofed Addresses, Application Layer Analysis—HTTP, HTTP Messages, Full Requests/Responses, Network Logs on Hosts, Tripwire.

Unit - 7

Data Hiding and obfuscation:

Obfuscation Using Encryption: Private-Key Data Hiding, Public-Key Data Hiding, Hashing, Encoding, Ex-OR Encoding, Coding.

Unit-8

07Hrs Obfuscation through Tunneling, Covert Channels: IP and TCP Data Hiding Watermarking and Stenography, Hiding File Contents: File Contents, GIF Files, JPEG File Format, ZIP File Format.

Text Book

1. Buchanan, William J. (2011). Introduction to Security and Network Forensics, CRC Press, ISBN: 978-0-8493-3568-6

Reference Books

- 1. Network Forensics: Tracking Hackers through Cyberspace Sherri Davidoff, Jonathan Ham, Prentice Hall publication, 1st edition
- 2. Applied Security Visualization, by Raffael Marty, Publisher: Addison Wesley Professional ISBN-10: 0-321-51010-0, ISBN-13: 978-0-321-51010-5

07Hrs

08Hrs

08Hrs





Functional Programming using Scala

Course: M.Tech. (CS&E) Subject Code: 14MCSC334 Maximum Marks: 50

Semester: III **Contact Hours: 60** Credits: 4:0:0

Examination Question Paper Pattern

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- 1. All questions carry equal marks.
- 2. Answer 5 questions out of 8 choosing at least 2 questions from each part.

Course Overview

This course gives an insight to a programming language design as exemplified by Scala, a new type-safe language that combines functional and object-oriented aspects at the language level and targets the Java Virtual Machine. Scala attempts to blend three aspects of thought into one language. These are: Functional programming and objectoriented programming, Expressive syntax and static typing and advanced language features and rich Java integration. The course also deals with Scala applications to concurrent programming.

Course Objective

- To analyze Scala in terms of several different programming paradigms.
- To evaluate the advantages and disadvantages of Scala over other object oriented • and functional programming languages.

PART - A

Unit-1

Introduction to Scala & Functional Programming: Functional programming meets object orientation, Static typing and expressiveness, Transparently working with the JVM, What is functional programming? Moving from OOP to functional programming, Functions in all shapes and forms, Thinking recursively, Algebraic data types, Why does functional programming matter?

Unit -2

Scala Core Rules & Coding Conventions: Read Eval Print Loop (REPL), Think in expressions, Prefer immutability, Use None instead of null, Polymorphic equality, Avoid coding conventions from other languages, Dangling operators and parenthetical expressions, Use meaningful variable names, Always mark overridden methods, Annotate for expected optimizations.

Unit-3

07Hrs OOP in Scala: Classes and constructors, Packaging, Scala imports, Objects and companion objects, Mixin with Scala traits, Case class, Named and default arguments and copy constructors, Modifiers, Value classes: objects on a diet, Implicit conversion with implicit classes, Scala class hierarchy.

08Hrs

Unit-4

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Implicits & Type system: Introduction to implicits, Enhancing existing classes with implicit views, Utilize implicit parameters with defaults, Limiting the scope of implicits, Types, Type constraints, Type parameters and higher-kinded types, Variance, Existential types, Capturing types with implicits, Use type classes, Conditional execution using the type system.

PART - B

Collections in Scala: Use the right collection, Immutable collections, Mutable collections, Changing evaluation with views and parallel collections, Writing methods to use with all collection types.

Unit-6

Unit-5

List, List Buffer and Patterns: Working with Set and Sorted Set, Working with Map and Tuple, Under the hood of for-comprehension, Use Option not Null, Category theory for computer science, Factors and monads, and how they relate to categories, Currying and applicative style, Monads as workflows

Unit-7

Concurrent programming in Scala: What is concurrent programming? Challenges with concurrent programming, Implementing message-passing concurrency with actors, Composing concurrent programs with Future and Promise, When should you not use actors?

Unit-8

Interoperability between Scala and Java& Scalable and distributed applications using Akka: Using Java classes in Scala, Using Scala classes in Java, Building web applications in Scala using Javaframe works, The philosophy behind Akka, Simple concurrency with Akka, Building a real-time pricing system: Akkaoogle.

Text Books:

- 1. Scala in Action, Nilanjan Raychaudhuri, Manning Publications, 2013
- 2. Scala in Depth, Joshua D. Suereth, Manning Publications, 2012

Reference Books

- 1. Programming in Scala: A Comprehensive Step-by-Step Guide, 2nd Edition by Martin Odersky , Lex Spoon
- 2. Programming Scala: Scalability = Functional Programming + Objects , Dean Wampler , Alex Payne , O'Reilly Media Publisher, 1 edition

07Hrs

08Hrs

08Hrs

06Hrs