

ST. JOSEPH'S COLLEGE (AUTONOMOUS)
BENGALURU-27
DEPARTMENT OF COMPUTER SCIENCE

SYLLABUS FOR POSTGRADUATE COURSE



Re-accredited with 'A++' GRADE and 3.79/4 CGPA by NAAC

Recognized by UGC as College of Excellence

To be implemented from 2018 -19 Batch

Course Structure and Syllabus for

**Master of Science
(Computer Science)
(Four Semester Course)**

Proposed for 2018 batch onwards

With

CHOICE BASED CREDIT SYSTEM (CBCS)

**Department of Computer Science
Faculty of Science
St. Joseph's College (Autonomous)**

DEPARTMENT OVERVIEW

VISION STATEMENT

The vision of the department is to make possible for our students to have a deep and analytical understanding of the field and to enable them to use their immense potential to enhance the quality of human life.

MISSION STATEMENT

The mission of the department is to offer a high-quality science education in the science of computing, as well as to prepare students for career opportunities in this area requiring a high level of technical knowledge and skill. The department will continue to develop and administer programs which serve the needs of industrial computer scientists, researchers, and computer application specialists for whom the discipline of computing sciences provides indispensable tools.

INTRODUCTION TO PROGRAM

Masters in Computer Science is a two years (four semesters) course. The course caters to the comprehensive knowledge of computers to the student. They are trained to acquire skills to trouble shoot in the areas of advanced computing. They are initiated into research and also they are moulded to be the best men and women in the challenging career of computing arena.

PROGRAM OBJECTIVE

Provide high quality training to the students through the latest computer technology. To trigger their mind in the field of research, provide an ambiance of learning; inculcate interdisciplinary approach in research and in working environment. Also to enable the students with team work, communication skills, professional attitude for their career.

**SEMESTER WISE COURSE STRUCTURE
FIRST SEMESTER**

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS7118	Object Oriented Programming using JAVA	4	4	30	70	100
CS7218	Theory of Computation	4	4	30	70	100
CS7318	Design and Analysis of Algorithm	4	4	30	70	100
CS7418	Advanced Computer Networks and Network Security	4	4	30	70	100
PRACTICAL						
MCS1P1	Object Oriented Programming using JAVA Lab	6	3	30	70	100
MCS1P2	Design and Analysis of Algorithm Lab	6	3	30	70	100

SECOND SEMESTER

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS8118	Advanced Database Management System and HADOOP	4	4	30	70	100
CS8218	Machine Learning	4	4	30	70	100
CS8318	Advanced Web Technology	4	4	30	70	100
CS8418	Principles of Compiler Design	4	4	30	70	100
CS8518	Software Project Management					
PRACTICAL						
MCS2P1	Advanced Database Management System Lab	6	3	30	70	100
MCS2P2	Artificial Intelligence And Advanced Web	6	3	30	70	100

	Technology Lab					
--	-----------------------	--	--	--	--	--

THIRD SEMESTER

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS9118	Data Warehousing and Data Mining	4	4	30	70	100
CS9218	Mobile Communication and Applications	4	4	30	70	100
Department Elective (One of the two)						
CSDE9318	1) Internet of Things	4	4	30	70	100
CSDE9418	2)Data Storage Technologies					
Open Elective (For other students)						
CSOE9518	Web Technologies	2	2	15	35	50
PRACTICAL						
MCS3P1	Mobile Applications Lab	6	3	30	70	100
MCS3P2	Mini Project	6	3	30	70	100

FOURTH SEMESTER

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS0118	Cloud Computing	4	4	30	70	100
CS0218	Advanced Operating System	4	4	30	70	100
CS0318	Data Analytics	4	4	30	70	100
PRACTICAL						
MCS4P1	Major Project / Dissertation	12	6	30	70	100

EXAMINATION AND ASSESMENTS

1. IA Weightage 30 %
2. End Semester Examination Weightage 70%

NOTE: The self study topics assigned in all the papers are within the syllabus and are included in the examination questions.

QUESTION PAPER PATTERN

The question papers of the theory examinations should follow the pattern specified below:

Section	Marks for each question	Number Of Questions		Total Marks
		Total	Should Answer	
A	10	9	7	70

While selecting the questions importance should be given to all the five units.

PRACTICAL QUESTION PAPER FORMAT

Scheme of valuation:

1. Writing two programs one from each section 20 marks
2. Execution of one program 20 marks
3. Formatting the program and output 10 marks
3. Record verification 10marks
4. Viva voce related to practical topics only 10 marks

Total 70 marks

PROJECT EVALUATION FORMAT

Scheme of valuation:

1.	Demonstration and presentation	35 marks
2.	Documentation	35 marks
	Total	70 marks

INTERNAL ASSESSMENT FORMAT

THEORY:

1.	IA test	20 marks
2.	One Activity	10 marks
	Total	30 marks

PRACTICALS:

Internal Marks for the practical will be assessed based on the work process of the students.

30 marks

Internal marks for the final semester project work can be awarded by the guide by evaluating the performance of the student during the course of the project work.

30 marks

FIRST SEMESTER

Title:	OBJECT ORIENTED PROGRAMMING USING JAVA
Code:	CS7118
Total Hours:	60 Hrs
Hours /week:	4
Credits:	4

Objectives

To introduce the concepts and principles of Java Programming language and to design and implement object oriented solutions to the simple and complex problems. Also to give students experience in Java Programming and program development within an integrated development environment.

Learning Outcome

An understanding of the principles and practice of object oriented programming in the construction of robust maintainable programs which satisfy the requirements. Competence in the use of Java Programming language in the development of small to medium sized application programs that demonstrate professionally acceptable coding and performance standards.

UNIT 1

(12)

OBJECT ORIENTED CONCEPT

Concept of programming paradigm, procedural paradigm and draw backs, object oriented paradigm concepts, OOP features - inheritance, polymorphism, encapsulation, abstraction and others (with examples), comparison of object oriented paradigm and other paradigms.

OOP as a way of viewing world - Members and methods, Responsibilities, Classes and Instances, Summary of Object-Oriented concepts, Introducing classes, Methods and Classes.

UNIT 2

(12)

INTRODUCTION TO JAVA

Know the history of Java, Requirements and Environment (JDK), Comparison with other languages, Java Architecture, Java Virtual Machine (JVM), J2EE, Program Structure, Data types , Variables and Operators ,Class Fundamentals, Creating and Operating Objects, Garbage Collection, Constructor, Access Control, Modifiers,

Nested Methods, Abstract Class, Argument Passing Mechanism, Method Overloading, dealing with Static Members, Finalize () Method, Use of “this “reference, Use of Modifiers with Classes and Methods. Wrapper classes.

ARRAYS AND STRINGS

Defining an Array, Initializing and Accessing Array, Multi-Dimensional Array, Operations on Strings, Creating Strings using String Buffer.

UNIT 3

(12)

EXTENDING CLASSES AND INHERITANCE

Use and Benefits of Inheritance in OOP, Types of Inheritance in java, role of Constructors in inheritance, Overriding Super Class Methods, Use of “super”, Implementing interfaces.

PACKAGES

Introduction, Java API Packages, Naming Conventions, Creating Packages, Accessing a Package, Adding a Class to a Package, Hiding Classes.java.io package, Streams and the new I/O Capabilities, Understanding Streams, the Classes for Input and Output.

UNIT 4

(12)

EXCEPTION HANDLING

Introduction, Types of Errors, Exceptions, Syntax of Exception Handling Code, Multiple Catch Statements, Using Finally Statement, Throwing Our Own Exceptions, Using Exceptions for Debugging.

THREAD

Introduction, Creating Threads, Extending the Thread Class, Stopping and Blocking a thread, Life Cycle of a thread, Using Thread Methods, Thread Exceptions, Thread Priority, Synchronization, Implementing the ‘Runnable’ Interface.

UNIT 5

(12)

DATABASE PROGRAMMING USING JDBC

Introduction to JDBC, JDBC Drivers and Architecture, Connecting to non-conventional Databases. Socket Programming- Remote Method Invocation- embedded SQL.

Self Study: Comparison of all Object Oriented programming languages

REFERENCES

- Herbert. Schildt, "Java the Complete Reference", 8thEdition, McGraw-Hill Osborne Media, 2011.
- Paul Deitel, "Internet and World Wide Web: How to Program", Prentice Hall, 4thEdition, 2007.
- Cay S. Horstmann and Gary Cornell, "CoreJava, Vol.2: Advanced Features", 8th Edition, Prentice Hall, 2008.
- RobertW.Sebesta, "Programming the World Wide Web", Addison-Wesley, Sixth Edition, 2010.
- Elliotte Rusty Harold, "Java Network Programming", Third Edition, O'Reilly, 2004.

BLUE PRINT OF THE QUESTION PAPER

UNIT	NO. OF QUESTIONS	MARKS	TOTAL MARKS
1	2	10	20
2	1.5	10	15
3	2	10	20
4	1.5	10	15
5	2	10	20
		Total Marks	90

Title: THEORY OF COMPUTATION

Code: CS7218

Total Hours: 60 Hrs

Hours /week: 4

Credits: 4

Objectives

- To lay the Foundation for Students to understand many branches of computer science like Compiler Design, Concurrent Systems and Software Engineering etc.
- Teach Students the most Fundamental concepts in Automata Theory and Formal Languages
- To let the students Analyze and compare the various properties by different techniques.

Learning Outcome:

- Students will have a clear understanding of the Mathematical Models of Computations.
- Students will develop Problem Solving ability for advanced computations and complex problems.

UNIT I

(10 Hrs)

INTRODUCTION TO SET THEORY CONCEPTS AND FINITE AUTOMATA

Introductory concepts of Sets, Introduction to Finite Automata, Definition of Alphabets, Strings, Languages, Sentences, Transition Functions and Extended Transition Functions, Notations to represent Automata. Deterministic Automata, Non Deterministic Automata, The central concepts of Automata theory, Understanding Mealy and Moore Machines, Applications of Finite Automata

UNIT II

(14 Hrs)

DFA, NFA PROBLEMS AND REGULAR EXPRESSION

Problem solving in DFA and NFA, Conversions from NFA to DFA, Finite automata with Epsilon-transitions, Conversions from Epsilon-NFA to DFA, Equivalence and Minimization of DFA. Introduction to Regular expressions, Finite Automata and Regular Expressions; Applications of Regular Expressions. Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages;

UNIT III

(16 Hrs)

CONTEXT-FREE GRAMMARS AND LANGUAGES

Introduction to Context Free grammars, Chomsky's Grammar Hierarchy, Derivation and Derivation Tree, Types of Derivation, Applications of Grammar, Ambiguity in grammars and Languages. Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFLs, Elimination of useless symbols, Epsilon productions, Unit productions. Representation of CNF and GNF. Conversion to CNF and GNF. Pumping lemma for CFLs and its use. Closure properties of CFLs. Decision problems for CFLs.

UNIT IV

(10 Hrs)

PUSHDOWN AUTOMATA

Definition of the Pushdown automata, Pushdown automata (PDAs): deterministic and nondeterministic. Instantaneous descriptions of PDAs. Language acceptance by final states and by empty stack. Equivalence of these two, the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata

UNIT V

(10 Hrs)

INTRODUCTION TO TURING MACHINE

Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers

Self study: Real-life modeling using automata theory

REFERENCES

- J.E.Hopcraft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
- Cohen, "Introduction to Computer Theory", John Wiley
- "Finite Automata and Formal Languages", A.M.Padma Reddy
- M. Sipser, Introduction to Theory of Computation, PWS Publishing Corporation, 1997.
- J.E. Hopcroft, J.D. Ullman, Introduction to Automata Theory, Languages and Computation, Addison-Wisley, 1979.
- T.C. Martin, Theory of Computation, Tata McGraw-Hill
- H.R. Lewis, C.H. Papadimitrou, Elements of the Theory of Computation, PHI.

BLUE PRINT OF THE QUESTION PAPER

UNIT	NO. OF QUESTIONS	MARKS	TOTAL MARKS
1	1	10	10
2	3	10	30
3	3	10	30
4	1	10	10
5	1	10	10
		Total Marks	90

Title: DESIGN AND ANALYSIS OF ALGORITHMS

Code: CS7318

Total Hours: 60 Hrs

Hours /week: 4

Credits: 4

Objective

To introduce the classic algorithms in the various domains and study the different techniques for designing efficient algorithms.

Learning outcome

- One can design efficient algorithms using the various approaches for real world problems.
- Analyze the running time of algorithms for problems in various domains.
- Implement the algorithms and design techniques to solve problems.

UNIT 1 (12)

INTRODUCTION

The Role of Algorithms in Computing. Analyzing Algorithms, Growth of functions using Asymptotic Notation, Recurrence relations. Design Methods: General Consideration, Algorithm design paradigms and representative problems.

UNIT 2 (12)

DIVIDE AND CONQUER

Binary search, Merge Sort, Quick Sort, Arithmetic with Large integers.

UNIT 3 (12)

GREEDY METHOD

Minimal Spanning Tree, Shortest Paths, Knapsack. Dynamic Programming, Chained Matrix Multiplication, Optimal Storage on Tapes, Shortest Paths (Dijkstra's and Floyd-Warshall algorithm), Optimal Search Trees.

UNIT 4**(12)****BACKTRACKING METHOD**

8-queens problem, Graph Coloring, Hamiltonian Cycles, Branch and Bound -0/1 Knapsack problem, Travelling Salesman problem, Approximation Graph Coloring, Task Scheduling, Bin Packing.

UNIT 5**(12)****GRAPH ALGORITHMS**

BFS, DFS and its applications. Polynomial Evaluation, Intractable Problems: Basic Concepts, Nondeterministic Algorithms, NP Completeness, Cook's Theorem, Examples of NP-Hard and NP-Complete problems.

Self Study: Binary Search, Examples of NP-Hard and NP-Complete Problems

REFERENCES

- E. Horowitz and S. Sahani, Fundamentals of Computer Algorithms, Galgotia, New Delhi.
- A.Aho, J. Hopcroft and J.Ullman, The Design and Analysis of Computer Algorithms, Addison Wesley.
- S.E.Goodman and S.T.Hedetniemi, Introduction to the Design and Analysis of Algorithms, McGraw Hill.
- G.Brassard, and P.Bratley, Algorithmics, PHI.
- S.K.Basu, Design Methods and Analysis of Algorithms, PHI.

BLUE PRINT OF THE QUESTION PAPER

UNIT	NO. OF QUESTIONS	MARKS	TOTAL MARKS
1	2	10	20
2	2	10	20
3	2	10	20
4	2	10	20
5	1	10	10
		Total Marks	90

Title: ADVANCED COMPUTER NETWORKS AND NETWORK SECURITY

Code: CS7418

Total Hours: 60 Hrs

Hours /week: 4

Credits: 4

Objectives

- To provide a solid understanding of the main issues related to the security in modern networked computer systems.
- To study the network components, topologies and network models.
- To study the various network protocols and algorithms.
- To understand concepts and foundations of computer security.
- Basic knowledge about security-relevant decisions in designing IT infrastructures.

Learning outcome

- Students will gain knowledge about networks, internal components and its functionality.
- Understand advanced computer network architecture, issues, principles and the importance of computer network security.
- Gain experience of analyzing, designing, implementing and validating solutions to computer network security challenges using common network security tools and formal methods.

UNIT I (12)

INTRODUCTION TO DIGITAL NETWORKS

WAN -WAN standards - Introduction- TCP/IP and Internet - network technologies - TCP/IP features, protocol standards, Internetworking concepts and Architectural model - Network interface layer.

UNIT 2 (12)

IP LAYER

Internet Address - Mapping Internet Address to physical Address - Determining an Internet address at startup - Transparent gateways and subnet addressing - multicast

Addressing – client server model of interaction – bootstrap protocol – domain name system – Address discovery and binding.

UNIT 3

(12)

INTERNET PROTOCOL

Connectionless Datagram delivery – data Structures and input processing. Routing IP datagram – error and control messages – protocol layering – user data gram protocol – reliable stream transport service –fragmentation and reassembly. Routing: cores – peers and algorithms – autonomous systems – interior gateways protocols – routing table and routing algorithms.

UNIT 4

(12)

NETWORK SECURITY

Introduction, Need for security, Principles of Security, Types of Attacks Cryptography : Plain text and Cipher Text, Substitution techniques, Caesar Cipher, Mono -alphabetic Cipher, Polygram, Polyalphabetic Substitution, Playfair, Hill Cipher, Transposition techniques, Encryption and Decryption, Symmetric and Asymmetric Key Cryptography.

UNIT 5

(12)

SYMMETRIC KEY ALGORITHMS AND AES

Algorithms types and modes, Overview of Symmetric key Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm, Firewalls and Virtual Private Networks: Brief Introduction to TCP/IP, Firewalls, IP Security, Virtual Private Networks (VPN), Intrusion.

Self Study: Examples for Mapping Internet Address to physical Address, cryptography techniques with examples, Encryption and decryption examples.

REFERENCES:

- Douglas E. Comer, “Internetworking with TCP/IP Volume I” , Prentice Hall.
- Douglas E. Comer, David L. Stevens, “Internetworking with TCP/IP Volume II” , Prentice Hall.
- Cryptography and Network Security by Atul Kahate, Second Edition, Tata McGraw Hill
- Cryptography and Network Security by William Stallings, Fifth Edition, Pearson Education
- Cryptography: Theory and Practice by Douglas Stinson, CRC Press, CRC Press

LLC

BLUE PRINT OF THE QUESTION PAPER

UNIT	NO. OF QUESTIONS	MARKS	TOTAL MARKS
1	2	10	20
2	2	10	20
3	1	10	10
4	2	10	20
5	2	10	20
		Total Marks	90

Title: OBJECT ORIENTED PROGRAMMING USING JAVA LAB
Code: MCS1P1
Hrs / Week: 6 Hrs
Credits: 3

Objective

The course is designed to provide a practical exposure of Java programming to the students.

Learning Outcome

Upon completion of the course, the students acquire the knowledge to build the logic and develop a solution for a problem statement.

Program List

1. constructor
2. garbage collection
3. Array (one and two dimensional)
4. access control
5. Method overloading (input from console also)
6. Inheritance
7. Interfaces and packages(getting the input from console)
8. Exception handling
9. Streams
10. Threads
11. Socket programming
12. JDBC
13. RMI

Title : DESIGN METHODS AND ANALYSIS OF ALGORITHM LAB

Code: MCS1P2

Hrs / Week: 6 Hrs

Credits: 3

Objectives

This course provides a more comprehensive understanding of data structure and algorithm development.

Learning outcome

Upon successful completion of the course the students

- Understand the need and working of search and sorting techniques.
- Ability to calculate and measure efficiency of algorithm.
- Understand the algorithms like Huffman, Quick Sort, and Shortest Path etc.,

Program List

1. Implementing Divide and Conquer MinMax Algorithm find the greatest and the smallest numbers from a given set of numbers.
2. Sort a given set of elements using the Quicksort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
3. Implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
4. Obtain the Topological ordering of vertices in a given digraph.
5. Compute the transitive closure of a given directed graph using Warshall's algorithm.
6. Implement 0/1 Knapsack problem using Dynamic Programming.
7. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
8. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
9. Print all the nodes reachable from a given starting node in a digraph using BFS method.
10. Check whether a given graph is connected or not using DFS method.

11. Find a subset of a given set $S = \{s_1, s_2, \dots, s_n\}$ of n positive integers whose sum is equal to a given positive integer d . For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$ there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. A suitable message is to be displayed if the given problem instance doesn't have a solution.
12. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
13. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
14. Implement N Queen's problem using Back Tracking.

SECOND SEMESTER

Title:	ADVANCED DATABASE MANAGEMENT SYSTEMS AND HADOOP
Code:	CS8118
Total Hours:	60 Hrs
Hours /week:	4
Credits:	4

Objectives

1. To understand the areas of database design and SQL.
2. To understand relational and object oriented database technology for building applications for the current trend.
3. Evaluate a business situation, designing and building database applications.

Learning Outcome

- Have a broad understanding of database concepts and database management system software.
- Have a high-level understanding of major DBMS components and their function.
- Should be able to model an application's data requirements using conceptual modeling tools like ER diagrams and design database schemas based on the conceptual model.
- Should be able to write SQL commands to create tables and indexes, insert/update/delete data, and query data in a relational DBMS.
- Should be able to program a data-intensive application using DBMS APIs.

UNIT 1

(12)

DATABASE CONCEPTS

Introduction to database, Characteristics of Database Approach -Functional Dependency, Normalization, Query Processing and Optimization- Introduction, General Optimization Strategies, Algebraic Manipulation-Algorithm for optimizing Relational Expressions.

UNIT 2

(12)

TRANSACTION PROCESSING AND CONCURRENCY CONTROL

Definition of Transaction and ACID properties, transaction Recovery, Concurrency Control Techniques: Lock based Concurrency control -Optimistic Concurrency Control - Timestamp based Concurrency Control, Deadlocks; Database Security: Security Issues - Control Measures- Discretionary, mandatory and role based access control; Database Recovery Techniques: Recovery Concepts- Deferred Update and Immediate Update techniques - Shadow Paging - ARIES.

UNIT 3

(12)

OBJECT ORIENTED, PARALLEL AND DISTRIBUTED DATABASES

Concept of Object Oriented Database: Object Definition Language ODL - Object Query Language; Object Database conceptual Design: Difference between ODB and RDB. Database System Architectures: Centralized and Client-Server Architectures, Parallel Systems and Distributed Systems

UNIT 4

(12)

PARALLEL DATABASES

I/O Parallelism - Inter and Intra Query Parallelism - Inter and Intra operation Parallelism - Design of Parallel Systems; Distributed Database Concepts - Distributed Data Storage - Distributed Transactions - Commit Protocols - Concurrency Control - Distributed Query Processing.

UNIT 5

(12)

INTRODUCTION TO HADOOP

Hadoop history, Distributing Processing System, Core Components of Hadoop, HDFS Architecture, Hadoop Master - Slave Architecture, Daemon types - Learn Name node, Data node, Secondary Name node.

Self Study: Data Models, Schemas, Three Schema Architecture and Data Independence; Database Design: ER Modeling - ER diagrams;

REFERENCES

- Jeffrey D. Ullman “Principles of Database Systems”, Third Edition, Galgotia Publication Pvt. Ltd.
- R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/ Addison Wesley, 2008.
- .Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Sixth Edition, McGraw Hill, 2011.
- C.J.Date, A.Kannan, S.Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
- Hadoop: The Definitive Guide by Tom White
- Hadoop Operations by Eric Sammer

BLUE PRINT OF THE QUESTION PAPER

UNIT	NO. OF QUESTIONS	MARKS	TOTAL MARKS
1	1	10	10
2	2	10	20
3	2	10	20
4	2	10	20
5	2	10	20
		Total Marks	90

Title: MACHINE LEARNING
Code: CS8218

Total Hours: 60 Hrs

Hours /week: 4

Credits: 4

Objective

To acquire basic knowledge in machine learning techniques and learn to apply the techniques in the area of pattern recognition and data analytics.

Learning Outcome

At the conclusion of course students are able to:

- Understand the basic principles of machine learning techniques.
- Understand the supervised and unsupervised machine learning algorithms.

UNIT 1

(12)

INTRODUCTION

Introduction to Artificial Intelligence, AI problems, Applications of AI, Introduction to Natural Language Processing and Expert System, Machine Learning, types of machine learning, examples. Supervised Learning: Learning class from examples, learning multiple classes, regression, model selection and generalization, Parametric Methods: Introduction, maximum likelihood estimation, evaluating estimator, Bayes' estimator, parametric classification.

UNIT 2

(12)

DIMENSIONALITY REDUCTION

Introduction, subset selection, principal component analysis, factor analysis, multidimensional scaling, linear discriminant analysis.

CLUSTERING

Introduction, mixture densities, k-means clustering, expectation-maximization algorithm, hierarchical clustering, choosing the number of clusters. Non-parametric: Introduction, non-parametric density estimation, non-parametric classification.

UNIT 3

(12)

DECISION TREES

Introduction, univariate trees, pruning, rule extraction from trees, learning rules from data.

MULTILAYER PERCEPTRON

Introduction, training a perceptron, learning Boolean functions, multilayer perceptron, backpropagation algorithm, training procedures.

UNIT 4

(12)

KERNEL MACHINES

Introduction, optimal separating hyper plane, v-SVM, kernel tricks, vertical kernel, defining kernel, multiclass kernel machines, one-class kernel machines.

BAYESIAN ESTIMATION

Introduction, estimating the parameter of a distribution, Bayesian estimation, Gaussian processes.

HIDDEN MARKOV MODELS

Introduction, discrete Markov processes, hidden Markov models, basic problems of HMM, evaluation problem, finding the state sequence, learning model parameters, continuous observations, HMM with inputs, model selection with HMM.

UNIT 5

(12)

GRAPHICAL MODELS

Introduction, canonical cases for conditional independence, d -separation, Belief propagation, undirected graph: Markov random field.

REINFORCEMENT LEARNING

Introduction, single state case, elements of reinforcement learning, temporal difference learning, generalization, partially observed state.

Self study - Clustering, Decision Tree

REFERENCES

- E. Alpaydin, Introduction to Machine Learning. 2nd MIT Press, 2009.
- K. P. Murphy, Machine Learning: A Probabilistic Perspective. MIT Press, 2012.
- P. Harrington, Machine Learning in Action. Manning Publications, 2012
- C. M. Bishop, Pattern Recognition and Machine Learning. Springer, 2011.
- Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B Nair, 3rd edition, McGraw Hill, 2009

BLUE PRINT OF THE QUESTION PAPER

UNIT	NO. OF QUESTIONS	MARKS	TOTAL MARKS
1	1	10	10
2	2	10	20
3	2	10	20
4	2	10	20
5	2	10	20
		Total Marks	90

Title: ADVANCED WEB TECHNOLOGIES
Code: CS8318

Total Hours: 60 Hrs

Hours /week: 4

Credits: 4

Objectives

1. To know and understand the concepts of internet programming.
2. To understand the concepts of XHTML, CSS, JAVASCRIPT, XML and PHP.
3. To develop own Web page and to host own web site on internet.

Learning outcome

1. The students will be able to build and select the essential technology needed to develop and implement web applications.
2. Ability to use Scripting language utilities for static and dynamic environment.
3. Ability to design XML document with presentation using CSS and XSLT.

UNIT I

(12)

FUNDAMENTALS

Internet, WWW, Web Browsers and Web Servers, URLs, MIME, HTTP, Security, Evolution of the Web, Internet Applications, Networks, TCP/IP, Search Engines.

XHTML

Basic syntax, Standard structure, Basic text markup, Images, Hypertext Links. Lists, Tables, Forms, Frames.

CASCADING STYLE SHEETS

Introduction, Levels of style sheets, Style specification formats, Selector forms, Property value forms, Font properties, List properties, Color, Alignment of text, The box model, Background images, The and <div> tags.

UNIT 2

(14)

THE BASICS OF JAVASCRIPT

Overview of JavaScript, Object orientation and JavaScript, Syntactic characteristics, Primitives, operations, and expressions, Screen output and keyboard input, Control statements, Object creation and modification, Arrays, Functions, Constructors, Pattern matching using regular expressions, Errors in scripts, Examples.

JAVASCRIPT AND HTML DOCUMENTS

The JavaScript Execution Environment, The Document Object Model, Elements Access in Java Script, Events and Event Handling, Handling Events from Body Elements, Handling Events from Text Box and password Elements, The DOM2 Event Model, The navigator Object, Dom Tree Traversal and Modification.

UNIT 3

(10)

INTRODUCTION TO XML AND JSON

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.

UNIT 4

(12)

INTRODUCTION TO PHP

Introduction to PHP, Language basics, Variable, constant, keywords, Data Types, Control Structures, Type casting, Type Juggling, \$_GET, \$_POST, \$_REQUEST Variables

FUNCTION AND STRING IN PHP

Defining and calling a function, Types of strings in PHP, Printing functions, Comparing strings, Manipulating and searching strings

ARRAYS IN PHP

Identifying elements of an array, storing data in arrays, Multidimensional arrays, sorting.

UNIT 5

(12)

MYSQL

Introduction to MySQL- select statements, creating database/tables, inserting values, updating and deleting, PHP with MySQL, creating connection, selecting database, file handling in PHP - reading and writing from and to FILE, Using MySQL from PHP.

Self study: Comparative study on XML and JSON.

REFERENCES

- M. Srinivasan: Web Technology Theory and Practice, Pearson Education, 2012.
- Jeffrey C. Jackson: Web Technologies- A Computer Science Perspective, Pearson Education, Eleventh Impression, 2012.
- Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
- Internet Technology and Web Design, Instructional Software Research and Development (ISRD) Group, Tata McGraw Hill, 2011.
- Programming PHP - RasmusLerdorf and Kevin Tatroe, O'Reilly publication,(3rd Edition).

BLUE PRINT OF THE QUESTION PAPER

UNIT	NO. OF QUESTIONS	MARKS	TOTAL MARKS
1	1	10	10
2	2	10	20
3	2	10	20
4	2	10	20
5	2	10	20
		Total Marks	90

Title: PRINCIPLES OF COMPILER DESIGN
Code: CS8418

Total Hours: 60 Hrs

Hours /week: 4

Credits: 4

Objective

To understand the phases of compiler, errors encountered by the compiler and code optimization.

Learning outcome

- The role of compiler to translate the source code to object code.
- Understand the six phases of compiler.
- Types of Errors Handled by compiler and the standard error messages.
- Understand the efficiency of the code optimization.
- The need of code generation to represent the intermediate code for the program.

UNIT 1

(12)

INTRODUCTION TO COMPILERS

Analysis of source program - Phase of compiler - Cousins of compilers - Simple one pass compiler: overview - Syntax definition Lexical analysis: removal of white space and comments - Constants - Recognizing identifiers and keywords - Lexical analysis - Role of a lexical analyzer - Input buffering -Specification of tokens - Recognition tokens.

UNIT 2

(12)

SYMBOL TABLES

Symbol table entries - List data structures for symbol table - Hash tables - Representation of scope information - Syntax Analysis: Role of parser - Context free grammar - Writing a grammar - Top down parsing - Simple bottom up parsing - Shift reducing parsing.

UNIT 3**(12)****SYNTAX ANALYSIS**

Syntax directed definition: Construction of syntax trees - Bottom up evaluation of S-Attributed definition - L-Attributed definitions - Top down translation - Type checking: Type systems - Specifications of simple type checker.

UNIT 4**(12)****RUN-TIME ENVIRONMENT**

Run-time environment: Source language issues - Storage organizations - Storage allocation strategies - Intermediate code generation: Intermediate languages - Declarations - Assignment statements.

UNIT 5**(12)****CODE GENERATION**

Issue in design of code generator - The target machine - Runtime storage management - Basic blocks and flow graphs - Code optimization: Introduction - Principle source of code optimization - Optimization of basic blocks.

Self Study: Examples for Intermediate code generation, optimization of code and Compiler types.

REFERENCES

- Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman, "Compilers : Principles, Techniques, and Tools, Pearson Education Asia.
- Dhamdhare D.M., "Compiler Construction: Theory and Practice", McMillan India Ltd.
- Holub Allen, "Compiler Design in C", Prentice Hall of India. (2nd Revised Edition)

BLUE PRINT OF THE QUESTION PAPER

UNIT	NO. OF QUESTIONS	MARKS	TOTAL MARKS
1	1	10	10
2	2	10	20
3	2	10	20
4	2	10	20
5	2	10	20
		Total Marks	90

Title: SOFTWARE PROJECT MANAGEMENT

Code: CS8518

Total Hours: 60 Hrs

Hours /week: 4

Credits: 4

Objectives

To introduce the fundamentals of software project management

- To give an insight into the project planning phase, selection of an appropriate project approach
- An in-depth study of software project models.
- To understand the concepts of effort estimation, activity planning, risk management.
- Understanding the methods for resource allocation, monitoring, control and people management.
- Understand the formal procedures for software quality.

Learning outcome

After learning the course the students should be able to explain about the fundamentals of software project management, he /she should be able to apply the project planning approaches and corresponding software models for upcoming projects. They should be able to understand the concept of effort estimation, activity planning and risk management. The student should get acquainted in concepts of managing teams. They should be able to recognize the importance of software quality.

UNIT 1

(12)

INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT

Introduction, Software project versus other types of projects, contract management and technical project management, activities covered by Software Project Management, plans methods and Methodologies, Categorizing Software Projects, setting objectives stakeholders, business case, requirement specification, Management control.

Project planning: Introduction and various steps in project planning.

UNIT 2

(12)

SELECTION OF APPROPRIATE PROJECT APPROACH

Choosing technologies, technical plan contents list, choice of process models, (structure versus speed of delivery), waterfall model, V-process model, spiral model, software prototyping, other ways of categorizing prototypes, controlling changes during prototyping, incremental delivery,(dynamic systems development method, extreme programming, Managing iterative processes), selecting more appropriate process model.

UNIT 3

(12)

SOFTWARE EFFORT ESTIMATION

Estimation Techniques top down estimation, bottom up estimation, Albrecht function point analysis, expert judgment, COCOMO Model, staffing pattern.

Activity planning: Objectives, When to plan, project schedules, projects and activities, sequencing and scheduling the activities, network planning models, formulating a network model, adding time dimension, forward pass, backward pass, identifying critical path, activity float, shortening project duration, identifying critical activities, activity-on-arrow networks.

UNIT 4

(12)

RISK MANAGEMENT

Nature of risk, types of risk, managing risk, hazard identification, hazard analysis, risk planning and control, evaluating risks to the schedule.

RESOURCE ALLOCATION

Nature of resources, identifying resource requirements, scheduling resources, creating critical paths, counting the cost, publishing resource schedule.

UNIT 5

(12)

MANAGING PEOPLE AND ORGANIZING TEAMS

Understanding behavior, organizational behavior: a background, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures, stress, health and safety.

SOFTWARE QUALITY

Place of software quality in project planning, importance of project quality, defining software quality, ISO 9126, practical software quality measures, product versus process quality management, external standards, techniques to help enhance software quality, quality plans.

Self study: COCOMO Model, various process models, case study on project planning and any one of the ISO standards.

REFERENCES

- Hughes, Bob and Cotterell, Mike, Software project Management, 4th Edition, TMH.
- Kathy Schwalbe, Information Technology Project Management, Vikas Publishing House.
- Kieron Conway, Software Project Management - From Concept to Deployment,
- Kelkar S. A, Information Technology Project Management, A concise study, PHI, 2005

BLUE PRINT OF THE QUESTION PAPER

UNIT	NO. OF QUESTIONS	MARKS	TOTAL MARKS
1	1	10	10
2	2	10	20
3	2	10	20
4	2	10	20
5	2	10	20
		Total Marks	90

Title: DATA BASE MANAGEMENT SYSTEMS LAB
Code : MCS2P1
Hrs / Week: 6 Hrs
Credits: 3

1. Database Customization using SQL
2. Creating Databases/Table spaces /constrains/keys
3. Create Objects
4. Moving Data
5. Recovery
6. Locking
7. Preparing Applications for Execution using a front end tool
8. Application Performance Tool

The students are supposed to practice and develop a mini application for above mentioned lab. The students can do the activity in a group (team) consisting of not more than two students. The entire application to be submitted by each team should be done with all the above activities.

Title: **ARTIFICIAL INTELLIGENCE AND WEB TECHNOLOGIES
LAB**

Code : **MCS2P2**

Hrs / Week: **6 Hrs**

Credits: **3**

ARTIFICIAL INTELLIGENCE

The students are supposed to practice and develop a mini application using Artificial Intelligence concepts (developing a chat bot, medical expert system etc). The students can do the activity in a group (team) consisting of not more than four students. The entire application to be submitted by each team.

ADVANCED WEB TECHNOLOGY LAB

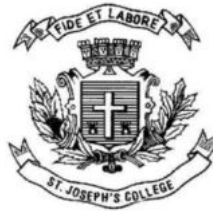
1. Create a simple web page using XHTML.
2. Create a class timetable using table tag.
3. Design web pages for your college containing a description of the courses, departments, faculties, library etc, use href, list tags.
4. Use frames to Include Images and Videos.
5. Create user Student feedback form (use textbox, text area, checkbox, radio button, select box etc.)
6. Add a Cascading Style sheet for designing the web page.
7. Use External, Internal, and Inline CSS to format college web page that you created.
8. Develop simple calculator using JavaScript
9. Design a dynamic web page with validation using JavaScript.
10. Create XML file to store student information like Enrollment Number, Name, Mobile Number, Email Id.
11. Design a simple online test webpage in PHP.
12. Using PHP script to read data from txt file and display it in html table
13. Using PHP script for user authentication using PHP-MYSQL. Use session for storing username.

ST. JOSEPH'S COLLEGE (AUTONOMOUS)

BENGALURU-27

DEPARTMENT OF COMPUTER SCIENCE

SYLLABUS FOR POSTGRADUATE COURSE



Re-accredited with 'A++' GRADE and 3.79/4 CGPA by NAAC

Recognized by UGC as College of Excellence

To be implemented from 2018 -19 Batch

Course Structure and Syllabus for

**Master of Science
(Computer Science)
(Four Semester Course)**

Proposed for 2018 batch onwards

With

CHOICE BASED CREDIT SYSTEM (CBCS)

**Department of Computer Science
Faculty of Science
St. Joseph's College (Autonomous)**

DEPARTMENT OVERVIEW

VISION STATEMENT

The vision of the department is to make possible for our students to have a deep and analytical understanding of the field and to enable them to use their immense potential to enhance the quality of human life.

MISSION STATEMENT

The mission of the department is to offer a high-quality science education in the science of computing, as well as to prepare students for career opportunities in this area requiring a high level of technical knowledge and skill. The department will continue to develop and administer programs which serve the needs of industrial computer scientists, researchers, and computer application specialists for whom the discipline of computing sciences provides indispensable tools.

INTRODUCTION TO PROGRAM

Masters in Computer Science is a two years (four semesters) course. The course caters to the comprehensive knowledge of computers to the student. They are trained to acquire skills to trouble shoot in the areas of advanced computing. They are initiated into research and also they are moulded to be the best men and women in the challenging career of computing arena.

PROGRAM OBJECTIVE

Provide high quality training to the students through the latest computer technology. To trigger their mind in the field of research, provide an ambiance of learning, inculcate interdisciplinary approach in research and in working environment. Also to enable the students with team work, communication skills, professional attitude for their career.

**SEMESTER WISE COURSE STRUCTURE
FIRST SEMESTER**

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS7118	Object Oriented Programming using JAVA	4	4	30	70	100
CS7218	Theory of Computation	4	4	30	70	100
CS7318	Design and Analysis of Algorithm	4	4	30	70	100
CS7418	Advanced Computer Networks and Network Security	4	4	30	70	100
PRACTICAL						
MCS1P1	Object Oriented Programming Lab	6	3	30	70	100
MCS1P2	Design and Analysis of Algorithm Lab	6	3	30	70	100

SECOND SEMESTER

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS8118	Advanced Database Management System and HADOOP	4	4	30	70	100

CS8218	Machine Learning	4	4	30	70	100
CS8318	Advanced Web Technology	4	4	30	70	100
CS8418	Principles of Compiler Design	4	4	30	70	100
CS8518	Software Project Management	4	4	30	70	100
PRACTICAL						
MCS2P1	Advanced Database Management System Lab	6	3	30	70	100
MCS2P2	Artificial Intelligence And Advanced Web Technology Lab	6	3	30	70	100

THIRD SEMESTER

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS9118	Data Warehousing and Data Mining	4	4	30	70	100
CS9218	Mobile Communication and Applications	4	4	30	70	100
Department Elective (One of the two)						

CSDE9318	1) Internet of Things	4	4	30	70	100
CSDE9418	2)Data Storage Technologies					
Open Elective (For other students)						
CSOE9518	Web Technologies	2	2	15	35	50
PRACTICAL						
MCS3P1	Mobile Applications Lab	6	3	30	70	100
MCS3P2	Mini Project	6	3	30	70	100

FOURTH SEMESTER

THEORY						
Code	Title	Hours Per Week	Credits	IA	SE	Total
CS0118	Cloud Computing	4	4	30	70	100
CS0218	Advanced Operating System	4	4	30	70	100
CS0318	Data Analytics	4	4	30	70	100
PRACTICAL						
MCS4P 1	Major Project/ Dissertation	12	6	60	140	200

EXAMINATION AND ASSESMENTS

1. IA Weightage 30 %
2. End Semester Examination Weightage 70%

NOTE: The self study topics assigned in all the papers are within the syllabus and are included in the examination questions.

QUESTION PAPER PATTERN

The question papers of the theory examinations should follow the pattern specified below:

Section	Marks for each question	Number Of Questions		Total Marks
		Total	Should Answer	
A	10	9	7	70

While selecting the questions importance should be given to all the five units.

PRACTICAL QUESTION PAPER FORMAT

Scheme of valuation:

1. Writing two programs one from each section 20 marks
2. Execution of one program 20 marks
3. Formatting the program and output 10 marks

3.	Record verification	10marks
4.	Viva voce related to practical topics only	10 marks
	Total	70 marks

PROJECT EVALUATION FORMAT

Scheme of valuation:

1.	Demonstration and presentation	35 marks
2.	Documentation	35 marks
	Total	70 marks

INTERNAL ASSESSMENT FORMAT

THEORY:

1.	IA test	20 marks
2.	One Activity	10 marks
	Total	30 marks

PRACTICALS:

Internal Marks for the practical will be assessed based on the work process of the students.

30 marks

Internal marks for the final semester project work can be awarded by the guide by evaluating the performance of the student during the course of the project work.

30 marks

THIRD SEMESTER

Title: DATA WARE HOUSING AND DATA MINING

Code: CS9118

Total Hours: 60 Hrs

Hours/week: 4

Credits: 4

Objectives

The student is made to be:

- Familiar with the concepts of data warehouse and data mining,
- Acquainted with the tools and techniques used for Knowledge Discovery in Databases.

Learning Outcome

- Ability to apply data mining techniques and methods to large data sets.
- Importance of data mining tools.
- Knowledge to compare and contrast the various classifiers.

UNIT I

DATA WAREHOUSE FUNDAMENTALS

(12)

Introduction to Data Warehouse, OLTP Systems, Differences between OLTP Systems and Data Warehouse, Characteristics of Data Warehouse, Functionality of Data Warehouse, Advantages and Applications of Data Warehouse, Top-Down and Bottom-Up Development Methodology, Tools for Data warehouse development, Data Warehouse Types.

UNIT II

(12)

DATA WAREHOUSE ARCHITECTURE

Introduction, Components of Data warehouse Architecture, Dimensional Modeling- Introduction, E-R Modeling, E-R Modeling VS Dimensional Modeling, Data Warehouse Schemas- Star Schema, Inside Dimensional Table, Inside Fact Table, Fact Less Fact Table, Granularity, Star Schema Keys, Snowflake Schema, Fact Constellation Schema.

UNIT III

(12)

EXTRACT, TRANSFORM AND LOAD

Introduction, ETL Overview or Introduction to ETL, ETL requirements and steps, ETL Tools.

Data Warehouse & OLAP: Introduction, What is OLAP?, Characteristics of OLAP, Steps in the OLAP Creation Process, Advantages of OLAP, What is Multidimensional Data, OLAP Architectures- MOLAP, ROLAP, HOLAP, Data Warehouse and OLAP-Hypercube & Multi cubes.

UNIT IV

(12)

DATA MINING

Introduction to Data Mining, Scope of Data Mining, What is Data Mining, How does Data Mining Works, Predictive Modeling.

Data preprocessing-Introduction, Overview, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

UNIT V

(12)

DATA MINING TECHNIQUES

An Overview, Data Mining Versus Database Management System, Association rules, Classification, Regression, Clustering, Neural networks.

Applications of Data mining- Introduction, Business Applications Using Data Mining- Risk management and targeted marketing, Customer profiles and feature construction, Medical applications (diabetic screening), Scientific Applications using Data Mining, Other Applications.

Self Study: Applications of Data Mining, ETL Tools.

REFERENCES

- Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw - Hill Edition, Thirteenth Reprint 2008.
- Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
- Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.
- K.P. Soman, Shyam Diwakar and V. Aja, "Insight into Data Mining Theory and Practice", Eastern Economy Edition, Prentice Hall of India, 2006.
- G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.

Title: MOBILE COMMUNICATION AND APPLICATIONS
Code: CS9218
Total Hours: 60 Hrs
Hours /week: 4
Credits: 4

Objectives

- To provide student with fundamental design paradigm and technologies of mobile communication and application.
- Features of 3G, 4G and its comparison.
- Knowledge of mobile application in software intensive systems.
- Synthesize knowledge in the area of mobile communication and application.
- Implementing the Android Studio in developing mobile application.

Learning outcomes

- To enable the student to analyze wireless and mobile cellular Communication systems.
- To enable the student to compare 3G and 4G wireless standards.
- Students will be able to develop and implement simple mobile application with help of Android Studio.

UNIT I (12)

INTRODUCTION

Mobile and Wireless Devices - Simplified Reference Model - Need for Mobile Computing - Wireless Transmission, Signals, Antennas, Multiplexing-SDM, FDM, TDM, CDM, Medium Access Control-SDMA, FDMA, TDMA, CDMA.

UNIT II (12)

GSM

Telecommunications System - GSM - System Architecture, Localization and calling, Hand over and Security, Satellite System, Wireless LAN, Bluetooth, Mobile IP-Goals, Packet Delivery, Registration - Tunneling and Reverse Tunnelling.

UNIT III

(12)

ANDORID OVERVIEW

A little background about mobile technologies, Different mobile technologies Android, Windows, IOS, Black Berry, series 40, Bada Nokia, Benefits and drawbacks of Smartphone programming, Overview of Android, How it all got started, Why Android different and important, Android Stack overview, Linux kernel, native libraries, App framework, Apps, SDK overview, platforms, tools, versions. Creating and setting up custom Android emulator.

UNIT IV

(12)

ANDROID INSTALLATION

Install the android SDK, Install base tools, install SDKs and Addons, Install apache Ant, Emulator and Device. Get know Eclipse, Build, install and Run the Application in your Emulator or Device, Project Structure.

UNIT V

(12)

DESIGNING USER INTERFACE

Designing by declaration, creating the opening screen, using alternate resources, implementing an about box, applying a theme, adding a menu, adding settings, debugging with log messages, debugging with debugger.

Self Study: IPV4 Features and Ten Interactive Mobile application development with various design tools.

REFERENCES

- Jochen Schiller, Mobile Communication, Addison Wesley, 2003. (unit 1,2 and3)
- Grant Allen, Beginning Android 4, Apress, 2012.(unit 4 and 5)
- Akash Bhardwaj, Mobile communication Design Fundamentals, Random Publications, 2017
- William Stallings, Wireless Communication and Networks, Pearson Education, 2003.

- Singhal, WAP-Wireless Application Protocol, Pearson Education, 2003.

Title: INTERNET OF THINGS

Code: CSDE9318

Hrs / Week: 4 Hrs

Credits: 4

Objectives

To provide students with the comprehensive understanding of IoT. To design new IoT based prototypes for real life situations.

Learning Outcomes

Upon completion of this course:

- The student will be able to understand the components of IoT and various network protocols.
- The Students will be able to analyze, design, and develop prototypes of Internet-connected products using appropriate tools.

UNIT 1

INTRODUCTION TO IoT, M2M AND IoT (12)

Definition and Characteristics, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies. Introduction to M2M, Difference between IoT and M2M, SDN and NFV for IoT.

UNIT 2

IoT PROTOCOLS AND DEVELOPING INTERNET OF THINGS (12)

IEEE 802.15.4, BACNet Protocol, Modbus, KNX, Zigbee. Architecture, 6LoWPAN, RPL .IoT Platforms Design Methodology, Python packages of Interest for IoT, IoT Physical Devices and Endpoints

UNIT 3

DATA ANALYTICS FOR IoT, IoT AND CLOUD (12)

IoT Physical Servers and Cloud Offerings, IoT Tools: Chef, Puppet. Big Data Platforms for the IoT, Hadoop Map Reduce for Batch Data Analysis, Apache Oozie Workflows for IoT Data Analysis, In-Memory Analytics using Apache Spark, Apache Storm for Real Time Data Analysis, Sustainability Data and Analytics in Cloud based M2M Systems, Fog Computing: A Platform for IoT and Analytics.

UNIT 4

IoT ARCHITECTURE (12)
Introduction, State of the art. Reference Model and architecture

UNIT 5 (12)

DOMAIN SPECIFIC IoT

Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health and Lifestyle, Virtual Reality Internet Advertising, Intelligent Transportation Systems, Health Information System: Genomics Driven Wellness Tracking and Management System(Go-WELL).Data representation and visualization, Interaction and remote control. Service-oriented architecture-based device integration, SOCRADES: realizing the enterprise integrated Web of Things, IMC-AESOP: from the Web of Things to the Cloud of Things.

REFERENCES

- Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012
- Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012
- Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014.
- Vijay Madiseti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1stEdition, VPT, 2014
- Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013

Title: DATA STORAGE TECHNOLOGIES

Code: CSDE9418

Hrs / Week: 4 Hrs

Credits: 4

Objectives

To introduce the concepts of Storage Area Networks, their characteristics and components and to become familiar with the SAN vendors and their products.

Learning Outcomes

The successful completion of this course the students will have knowledge of:

- Knowlegde about various Storage Technology
- Storage Systems Architecture
- Knowledge about Networked Storage
- Information Availability
- Securing Storage and Storage Virtualization

UNIT I

INTRODUCTION TO STORAGE TECHNOLOGY (10)

Introduction to Information storage-Data, Types of data, Big data, Information, Storage. Evolution of storage architecture, Data center Infrastructure, Virtualization and cloud computing. Data Center Environment-Application. Database management system, Host, Connectivity, Storage, Disk drive components, Disk drive performance, Host access to data, Direct attached storage, Storage design based on application, Disk native command queuing, Introduction to flash drives.

UNIT II

DATA PROTECTION AND INTELLIGENT STORAGE SYSTEMS (10)

RAID implementation methods, RAID array components, RAID techniques, RAID levels: RAID 0, RAID 1, Nested RAID, RAID 3, RAID 4, RAID 5, RAID 6, RAID impact on Disk performance, RAID Comparison, Hot Spares. Intelligent Storage Systems: Components of an intelligent

storage system, Front end, cache, Backend, Physical disk, Storage provisioning, Traditional, Virtual, LUN masking, Types of Intelligent storage systems.

UNIT III

(15)

STORAGE NETWORKING TECHNOLOGIES

Fibre Channel storage area networks: Fiber channel overview, The SAN and its evolution, Components of FC SAN, FC Connectivity, Switched Fabric Ports, Fibre channel architecture, Fibre channel addressing, worldwide names, FC Frame, Flow Control, Fabric services, Switched fabric login types, Zoning, FC SAN Topologies, Virtualization in SAN. IP SAN and FCoE: iSCSI, FCIP, FCoE.

UNIT IV

(15)

NETWORK ATTACHED STORAGE

General purpose servers versus NAS Devices, Benefits of NAS , File Systems and network file sharing ,Components of NAS, NAS I/O operation, NAS Implementation, AS file sharing protocols, Factors affection NAS performance, File level Virtualization.

UNIT V

(10)

INTRODUCTIONS TO INFORMATION AVAILABILITY

Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles and techniques Managing & Monitoring Management philosophies (holistic vs. system & component), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance).

Self Study: Key management metrics (thresholds, availability, capacity, security, performance).

REFERENCES

- Information Storage and Management, Wiley Publications by EMC².
- Marc Farley Osborne, "Building Storage Networks", Tata Mcgraw Hill, 2006
- Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, 2002
- Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2006
- Gerald J Kowalski / Mark T Maybury ,Information Storage & Retrieval Systems Theory & Implementation, , BS Publications, 2006

Title: MOBILE APPLICATION LAB

Paper Code: MCS3P1

Hrs / Week: 6 Hrs

Credit: 3

List of programs

1. Design an activity that contains user id and password.
2. Creating an Application that displays message based on the screen orientation.
3. Create an application that displays custom designed Opening Screen.
4. Create menu in Application.
5. Play an audio, based on the user event.
6. Read/ write the Local data.
7. Display Map based on the Current location.
8. Create / Read / Write data with database (SQLite).
9. Hello world - windows app
10. Design a Lock Screen in the existing app.
11. Learn to deploy both android Mobile Applications window application (Any 3 programs).
12. Develop an application that uses GUI components, Font and Colours
13. Develop an application that uses Layout Managers and event listeners.
14. Write an application that draws basic graphical primitives on the screen.

TITLE : Mini Project

CODE : MCS3P2

Hrs / Week : 6 Hrs

CREDITS : 3

1. The students should choose a Mini Project beginning of the semester with the approval of the HOD.
2. The students will be evaluated by the lab in-charge on a weekly basis.
3. The projects can be designed with real time application in mind.

4. At the end the students should submit a documentation and prepare a presentation to explain the work that has been done.

Title: WEB TECHNOLOGIES

Code: CSOE9518 (Open elective for other students)

Hrs / Week: 2 Hrs

Credits: 2

Objectives

On successful completion of the course the students will be able to do the following:

- To provide an in-depth training for web development skills.
- To understand and develop a website independently.
- To understand the methods of debugging and correcting anomalies.
- To provide a proper foundation for learning enhanced tools of web development.

Learning Outcomes

- The will students know the various Internet Protocol functions.
- Knowledge to design a Website with various web application software.
- Knowledge to create an interactive web pages client side and server side.

UNIT I (8)

INTERNET BASICS

Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address, World Wide Web and its evolution, uniform resource locator (URL), browsers - internet explorer, Netscape navigator etc. search engine, web saver - apache, proxy server, HTTP protocols.

UNIT II (6)

WEB DESIGNING TECHNOLOGIES

Introduction HTML/DHTML – file creation, HTML tags, titles footers, text formatting, forms, images, lists, tables, linking documents, front page editing, frame sets, order list, un-order list, special characters

UNIT III

(10)

JAVA SCRIPT

Introduction to Java script, writing java script into HTML, Building of Java Script Syntax Data types of variables, arrays, operators, expressions, programming construct of conditional checking, loop ends functions, dialogue boxes, properties and methods, browsers objects, understanding DOM, web page events.

UNIT IV

(6)

CASCADING STYLE SHEETS

Understanding the importance of CSS, Types: inline, internal and external with examples. Selector types: id, class and overriding the styles.

Self Study: Work with various HTML tags with latest browsers.

REFERENCES:

- M. Srinivasan: Web Technology Theory and Practice, Pearson Education, 2012.
- Jeffrey C. Jackson: Web Technologies- A Computer Science Perspective, Pearson Education, Eleventh Impression, 2012.
- Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2009.
- Internet Technology and Web Design, Instructional Software Research and Development (ISRD) Group, Tata McGraw Hill, 2011.

FOURTH SEMESTER

Title: CLOUD COMPUTING

Code: CS0118

Hrs / Week: 4 Hrs

Credits: 4

Objectives

- The course presents a top-down view of cloud computing, from applications and administration to programming and infrastructure.
Its main focus is on parallel programming techniques for cloud computing and large scale distributed systems which form the cloud infrastructure.
- Overview of cloud computing, cloud systems, Cloud Service Administration, Accessing the Cloud parallel processing in the cloud, distributed storage systems, virtualization, cloud standards, and Migrating to the Cloud.
- Knowledge about the state-of-the-art solutions for cloud computing developed by Google, Amazon, Microsoft, Yahoo, VMWare, etc. Students will also apply what they learn in one programming assignment and one project executed over Amazon Web Services.

Learning outcomes

- To enable the student to analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.
- Compare the advantages and disadvantages of various cloud computing platforms.
- Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine.
- Program data intensive parallel applications in the cloud.

INTRODUCTION

Introduction- Objectives, From collaborative to the Cloud - A short history Client - Server Computing, Peer-to-Peer Computing, Distributed Computing, Collaborative Computing, Cloud Computing, Functioning of Cloud Computing, Cloud Architecture, Cloud Storage, Cloud Services, Industrial Applications .Business Values, Introduction- Objectives, Service Modeling, Infrastructure Services, Platform Services, Software Services - Software as service modes- Massively scaled software as a service- Scale of Economy, Management and Administration.

UNIT II

(12)

CLOUD SERVICE ADMINISTRATION

Cloud Service Administration- Service Level Agreements and Monitoring- Support Services- Accounting Services, Resource Management- IT Security- Performance Management- Provisioning- Service Management, Untangling Software Dependencies. Cloud Computing Technology- Introduction-Objectives, Clients - Mobile - Thin - Thick, Security - Data Linkage - Offloading Work - Logging - Forensics - Development - Auditing, Network- Basic Public Internet- The Accelerated Internet- Optimised Internet Overlay- Site-to-Site VPN- Cloud Providers- Cloud Consumers - Pipe Size- Redundancy, Services- Identity- Integration- Mapping- Payments- Search.

UNIT III

(12)

ACCESSING THE CLOUD

Introduction-Objectives, Platforms- Web Application Framework- Web Hosting Services- Proprietary Methods, Web Applications- API's in Cloud Computing, Browsers for Cloud Computing- Internet Explorer- Mozilla Firefox- Safari- Chrome. Data Management- Introduction- Objectives, Data Security- Data Location- Data Control- Securing data for transport, Scalability and Cloud Services- Large Scale Data Processing- Databases and Data Stores- Data Archival.

UNIT IV

(12)

INFORMATION STORAGE IN CLOUD COMPUTING

Introduction- Objectives, Storage as a Service, Storage Providers- Amazon Simple Storage Service- Nirvana- Google Big table Data store- Mobile Me- Live Mesh, Storage Security, Merits and Demerits of Storage. Defining a private cloud- Public, Private, and Hybrid Clouds - A Comparison, Examining the Economics of the private cloud

CLOUD COMPUTING STANDARDS

Introduction- Objectives, Best Practices and Standards, Practical Issues- Interoperability- Portability- Integration- Security, Standards Organizations and Groups- Cloud Security Alliance- Distributed Management Task Force (DMTF)- National Institute of Standards and Technology (NIST)- Open Cloud Consortium (OCC)- Open Grid Forum (OGF)- Object Management Group (OMG)- Storage Networking Industry Association (SNIA)- Cloud Computing Interoperability Forum (CCIF)- Vertical Groups. Migrating to the Cloud- Introduction- Objectives, Cloud Services for individuals- Available Services - Sky tap Solution, Cloud Services Aimed at the mid - market, Enterprise Class Cloud Offerings

REFERENCES

- Cloud Computing: Concepts, Technology & Architecture by Thomas Earl.
- Cloud computing from beginning to End by Ray J.Rafaels
- Building the infrastructure for cloud security by RaghuRamYeluri
- Architecting the Cloud: Design Decisions for cloud computing service models by Michael Jokai
- The Great Cloud Migration by Michael C.Daconta.

Title: ADVANCED OPERATING SYSTEM

Code: CS0218

Hrs / Week: 4 Hrs

Credits: 4

Objectives

- To make the student understand with various function of Operating system.
- The knowledge of resources management of Operating system.
- The knowledge about various problems and solution is distributed system.
- The knowledge about fault tolerance.

Learning Outcomes

- The student will know the various approaches in distributed operating system.
- The student can find the efficiency of various techniques used to solve the problem of concurrent access of resources.
- The student will be able to understand the approaches to recover the lost data in the database by various recovery techniques.

UNIT I

(12)

INTRODUCTION

Overview - Functions of an Operating System - Design Approaches - Types of Advanced Operating System - Synchronization Mechanisms - Concept of a Process, Concurrent Processes - The Critical Section Problem, Other Synchronization Problems - Language Mechanisms for Synchronization - Axiomatic Verification of Parallel Programs - Process Deadlocks - Preliminaries - Models of Deadlocks, Resources, System State - Necessary and Sufficient conditions for a Deadlock - Systems with Single-Unit Requests, Consumable Resources, and Reusable Resources.

UNIT II

(12)

DISTRIBUTED OPERATING SYSTEMS

Introduction - Issues - Communication network and Primitives, - Theoretical Foundations: Inherent Limitations - Lamport's Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection. Distributed Mutual Exclusion Non-Token Based Algorithms - Lamport's Algorithm - Token-Based Algorithms Suzuki-Kasami's Broadcast Algorithm - Distributed Deadlock Detection - Issues Centralized Deadlock-Detection Algorithms - Distributed Deadlock-Detection Algorithms. Agreement Protocols - Classification(two)- Solutions(two) -Applications.

UNIT III (12)

DISTRIBUTED RESOURCE MANAGEMENT

Distributed File systems - Architecture - Mechanisms - Design Issues - Distributed Shared Memory - Architecture - Algorithm(two) - Protocols - Design Issues. Distributed Scheduling - Issues - Components(two) - Algorithms (two).

UNIT IV (12)

FAILURE RECOVERY AND FAULT TOLERANCE

Basic Concepts-Classification of Failures - Basic Approaches to Recovery; Recovery in Concurrent System; Synchronous and Asynchronous Check pointing and Recovery; Check pointing in Distributed Database Systems; Fault Tolerance; Issues - Two-phase and Nonblocking Commit Protocols; Voting Protocols; Dynamic Voting Protocols.

UNIT V (12)

MULTIPROCESSOR AND DATABASE OPERATING SYSTEMS

Structures - Design Issues - Threads - Process Synchronization - Processor Scheduling - Memory Management - Reliability / Fault Tolerance(two); Database Operating Systems - Introduction - Concurrency Control - Distributed Database Systems - Concurrency Control Algorithms(two).

Self Study - Analysis of any open source operating system and study of algorithms in the chapters.

REFERENCES

- Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2001.
- Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating

Systems”, McGraw- Hill, 2001

- Abraham Silberschatz, Peter B. Galvin, G. Gagne, “Operating System Concepts”, Sixth Edition, Addison Wesley Publishing Co., 2003.

Title: DATA ANALYTICS

Code: CS0318

Hrs / Week: 4 Hrs

Credits: 4

Objectives

The Student Should Be Made To:

- Be Exposed To Big Data
- Learn The Different Ways Of Data Analysis
- Be Familiar With Data Streams
- Learn The Mining And Clustering
- Be Familiar With The Visualization

Learning Outcomes

The Student Should Be Made To:

- Apply The Statistical Analysis Methods.
- Compare And Contrast Various Soft Computing Frameworks.
- Design Distributed File Systems.
- Apply Stream Data Model.
- Use Visualisation Techniques

UNIT I

(12)

INTRODUCTION TO BIG DATA

Introduction To Big Data Platform – Challenges Of Conventional Systems – Web Data – Evolution Of Analytic Scalability, Analytic Processes And Tools, Analysis Vs Reporting – Modern Data Analytic Tools.

UNIT II (12)

DATA ANALYSIS

Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference And Bayesian Networks, Support Vector And Kernel Methods, Analysis Of Time Series: Linear Systems Analysis, Nonlinear Dynamics – Rule Induction – Neural Networks: Learning And Generalization, Competitive Learning.

UNIT III (12)

MINING DATA STREAMS

Introduction To Streams Concepts – Stream Data Model And Architecture – Stream Computing, Sampling Data In A Stream – Filtering Streams – Counting Distinct Elements In A Stream – Estimating Moments – Counting Oneness In A Window – Decaying Window – Real time Analytics Platform(RTAP) Applications – Case Studies – Real Time Sentiment Analysis, Stock Market Predictions.

UNIT IV (12)

FREQUENT ITEMSETS AND CLUSTERING

Mining

Frequent Item sets – Market Based Model – Apriori Algorithm – Handling Large Data Sets In Main Memory – Limited Pass Algorithm – Counting Frequent Itemsets In A Stream – Clustering Techniques – Hierarchical – K- Means – Clustering High Dimensional Data – CLIQUE And PROCLUS – Frequent Pattern Based Clustering Methods

UNIT V (12)

FRAMEWORKS AND VISUALIZATION

Map Reduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed File Systems – Visualizations – Visual Data Analysis Techniques, Interaction Techniques; Systems And Applications

REFERENCES

- Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
- Anand Rajaraman And Jeffrey David Ullman, Mining Of Massive Datasets, Cambridge University Press, 2012.
- Bill Franks, Taming The Big Data Tidal Wave: Finding Opportunities In Huge Data Streams with Advanced Analytics, John Wiley & Sons, 2012.
- Glenn J. Myatt, Making Sense Of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O Reilly, 2011.
- Jiawei Han, Micheline Kamber "Data Mining Concepts And Techniques", Second Edition, Elsevier, Reprinted 2008.

PRACTICALS

TITLE : Major Project / Dissertation Lab

CODE : CS4P1

Hrs / Week : 6 Hrs

CREDITS : 3

1. The students should choose a Major Project/ Research activity / Dissertation at the beginning of the semester with the approval of the HOD.
2. The students will be evaluated by the lab in-charge on a weekly basis.
3. The questions can be designed with real time application in mind.
4. At the end the students should submit a documentation and prepare a presentation to explain the work that has been done.