SCHEME And SYLLABUS For All Semesters
(With effect from 2024-25 Admitted Batch)

Master of Science in Computer Science (M.Sc.)

Department Of Information Technology & Computer Applications

M.Sc(CS) Wef 2024-2025 Admitted Batch

1st Year I SEMESTER

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MSCS 1.1	Artificial Intelligence	4	--	70	30	100	4
MSCS 1.2	Data Structures & Algorithms Using C++	4	--	70	30	100	4
MSCS 1.3	Computer Organization & Architecture	4	--	70	30	100	4
MSCS 1.4	Object oriented Programming using JAVA	4	--	70	30	100	4
MSCS 1.5	Database Management Systems	4	--	70	30	100	4
MSCS 1.6	Data Structures & Algorithms Lab using C++/JAVA	--	3	50	50	100	2
MSCS 1.7	Computer Organization Lab	--	3	50	50	100	2
MSCS 1.8	Database Management Systems Lab	--	3	50	50	100	2
Total		20	9	500	300	800	26

M.Sc(CS) Wef 2024-2025 Admitted Batch

1st Year II SEMESTER

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MSCS 2.1	Formal Languages & Automata Theory	4	--	70	30	100	4
MSCS 2.2	Datawarehouse & Data Mining	4	--	70	30	100	4
MSCS 2.3	Data Communications & Computer Networks	4	--	70	30	100	4
MSCS 2.4	Internet of things	4	--	70	30	100	4
MSCS 2.5	Elective-I	4	--	70	30	100	4
MSCS 2.6	DataWarehouse & Data Mining Lab with R/ Python	--	3	50	50	100	2
MSCS 2.7	Data Communications & Computer Networks Lab	--	3	50	50	100	2
Total		**20**	**6**	**450**	**250**	**700**	**24**

Elective I: Big Data Analytics/ Image processing/ Embedded Systems

M.Sc(CS) Wef 2024-2025 Admitted Batch

2nd year I SEMESTER

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MSCS 3.1	Object Oriented Software Engineering	4	--	70	30	100	4
MSCS 3.2	Cryptography & Network Security	4	--	70	30	100	4
MSCS 3.3	Elective - II	4	--	70	30	100	4
MSCS 3.4	Elective III	4	--	70	30	100	4
MSCS 3.5	MOOCS-I		--	--	--	100	2
MSCS 3.6	OOSE Lab	--	3	50	50	100	2
MSCS 3.7	Network Security Lab	--	3	50	50	100	2
MSCS 3.8	Seminar on Advanced Topics	--	--	--	--	--	3
Total		16	6	450	250	700	25

Elective II : web technologies/ Mobile Computing/ Block chain Technology

Elective III: Machine learning/ Operations Research/ Cloud Computing

MOOCS-I :

Each student should learn any one of the following topics by registering for courses through Online instruction from standard e-learning portals like nptel, coursera, etc. and write the examination conducted as per the university norms.

List of topics for MOOCS-I:

Advanced Computer Networks/ R Programming for Data Analytics/ Data Visualization using Tableau/ MongoDB for Developers/ DevOps/Agile Technologies for Software Development/ Data Science

M.Sc(CS) Wef 2024-2025 Admitted Batch

2nd year II SEMESTER

Code	NAME OF THE SUBJECT	MAXIMUM MARKS			CREDITS
		INTERNAL	EXTERNAL	TOTAL	
MSCS 4.1	PROJECT/ THESIS WORK	50	50	100	14
Total Credits (Complete Course)					89

M.Sc(CS) Wef 2024-2025 Admitted Batch
1st Year I SEMESTER

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MSCS 1.1	Artificial Intelligence	4	--	70	30	100	4
MSCS 1.2	Data Structures & Algorithms Using C++	4	--	70	30	100	4
MSCS 1.3	Computer Organization & Architecture	4	--	70	30	100	4
MSCS 1.4	Object oriented Programming using JAVA	4	--	70	30	100	4
MSCS 1.5	Database Management Systems	4	--	70	30	100	4
MSCS 1.6	Data Structures & Algorithms Lab using C++/JAVA	--	3	50	50	100	2
MSCS 1.7	Computer Organization Lab	--	3	50	50	100	2
MSCS1.8	Database Management Systems Lab	--	3	50	50	100	2
Total		20	9	500	300	800	26

MSCS1.1 ARTIFICIAL INTELLIGENCE

Course Objectives:

- To learn about AI problem, Production Systems and their characteristics.
- To understand the importance of search and the corresponding search strategies for solving AI problem.
- To introduce to Planning, Natural Language Processing and Expert Systems.

Course Outcomes:

- The Student understands AI problem characteristics, state space approach for solving AI problem, Production System framework.
- The student learn several optimal search strategies and the use of heuristics.
- The student learns relational, inferential, inheritable and procedural knowledge and the corresponding knowledge representation approaches.
- The student is introduced to applying AI problem solving approaches to natural language processing, planning and expert systems.

Syllabus:

Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI Techniques, Defining the Problem as a State Space Search, Problem Characteristics, Production Systems.

Search Techniques: Issues in The Design of Search Programs, Un-Informed Search, BFS, DFS; Heuristic Search Techniques: Generate-And- Test, Hill Climbing, Best-First Search, A* Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis.

Knowledge Representation using Rules: Procedural Vs Declarative Knowledge, Logic programming, Forward Vs Backward Reasoning, Matching Techniques, Partial Matching, RETE Matching Algorithm AI Programming languages: Overview of LISP and PROLOG, Production System in Prolog.

Symbolic Logic: Propositional Logic, First Order Predicate Logic: Representing Instance and is-a Relationships, Computable Functions and Predicates, Unification & Resolution, Natural Deduction; Structured Representations of Knowledge: Semantic Nets, Partitioned Semantic Nets, Frames, Conceptual Dependency, Conceptual Graphs, Scripts.

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Logics for Non-Monotonic Reasoning, Statistical Reasoning: Bayes Theorem, Certainty Factors and Rule-Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic: Crisp Sets ,Fuzzy Sets, Fuzzy Logic Control, Fuzzy Inferences &Fuzzy Systems.

Natural Language Processing: Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis, NLP Understanding Systems; Planning: Components of a Planning System, Goal Stack Planning, Non-linear Planning using Constra it Posting, Hierarchical Planning, Reactive Systems.

Experts Systems: Overview of an Expert System, Architecture of an Expert Systems, Different Types of Expert Systems Rule Based, Frame Based, Decision Tree based, Case Based, Neural Network based, Black Board Architectures, Knowledge Acquisition and Validation Techniques, , Knowledge System Building Tools, Expert System Shells.

Text Books:

1. Artificial Intelligence, Elaine Rich and Kevin Knight, Tata Mcgraw -Hill Publications
2. Python Programming: A modular approach by Pearson; by TanejaSheetal (Author), Kumar Naveen.

References:

1. Artificial Intelligence, George F Luger, Pearson Education Publications
2. Artificial Intelligence : A modern Approach, Russell and Norvig, Print ice Hall
3. Introduction To Artificial Intelligence & Expert Systems, Patterson, PHI publications

MSCS1.2 DATA STRUCTURES THROUGH C++

ARRAYS: Abstract Data Types and the C++ Class, An Introduction to C++ Class- Data Abstraction and Encapsulation in C++- Declaring Class Objects and Invoking Member Functions- Special Class Operations- Miscellaneous Topics- ADTs and C++Classes, The Array as an Abstract Data Type, The Polynomial Abstract Data type- Polynomial Representation- Polynomial Addition, Representation of Arrays.

STACKS AND QUEUES: Templates in C++, Template Functions- Using Templates to Represent Container Classes, The Stack Abstract Data Type, The Queue Abstract Data Type, Subtyping and Inheritance in C++, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix.

LINKED LISTS: Single Linked List and Chains, Representing Chains in C++, Defining a Node in C++- Designing a Chain Class in C++- Pointer manipulation in C++- Chain Manipulation Operations, The Template Class Chain, Implementing Chains with Templates- Chain Iterators- Chain Operations- Reusing a Class.

CIRCULAR LISTS: Available Space Lists, Linked Stacks and Queues, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Equivalence Classes, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input- Deleting a Sparse Matrix, Doubly Linked Lists, Generalized Lists, Representation of Generalized Lists- Recursive Algorithms for Lists- Reference Counts, Shared and Recursive Lists

TREES: Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Tress, Binary Tree Representations, Binary Tree Traversal and Tree Iterators, Introduction, Inorder Traversal Preorder Traversal, Postorder Traversal, Thread Binary Trees, Threads, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree, Heaps, Priority Queues, Definition of a Max Heap, Insertion into a Max Heap, Deletion from a Max Heap, Binary Search Trees, Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree, Height of Binary Search Tree.

GRAPHS: The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation, Depth First Search, Breadth First Search, Connected Components, Spanning Trees, Biconnected Components, Minimum Cost Spanning Trees, Kruskal S Algorithm, Prim s Algorithm Sollin' s Algorithm, Shortest Paths and Transitive Closure, Single Source/All Destination: Nonnegative Edge Cost, Single Source/All Destination: General Weights, All-Pairs Shortest Path, Transitive Closure.

SORTING: Insertion Sort, Quick Sort, Merge Sort Merging, Iterative Merge Sort, Recursive Merge Sort, Heap Sort.

Text Books

1. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press, Pvt. Ltd.

2. Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.
3. Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and Mount, Wiley student edition, John Wiley and Sons.

Reference Books

1. Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
2. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
3. Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

MSCS1.3 COMPUTER ORGANIZATION AND ARCHITECTURE

Course Objectives

- To study about structure and functional components of a computer.
  - Understanding the hierarchical organization of a computer system which consists of instruction set of commands.
- Learn about the architecture of a computer from a programming view.
  - To design a balance system that minimizes performance and utilization of all elements.

Course Outcomes

By the end of the course, the student should be able to:

  - Demonstrate knowledge about major components of a computer such as processor, memory and I/O modules along with their interconnections internally with outside world.
  - have detailed idea about architecture of central processing unit, functions of control unit, memory, I/O devices and their issues.
- Understand simple and multiple processor organization and their issues.

SYLLABUS

Register Transfer and Micro operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input- Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit.

Central Processing Unit: Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC), Architecture and Programming of 8085 Microprocessor

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISK Pipeline, Vector Processing, Array Processors.

Input/output Organization: Peripheral Devices, I/O interface, Asynchronous data transfer, Modes of transfer, priority Interrupt, Direct memory access, Input-Output Processor (IOP), Serial Communication.

Memory Organization: Memory Hierarchy, Main memory, Auxiliary memory, Associate Memory, Cache Memory, and Virtual memory, Memory Management Hardware.

Text Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008.
2. Computer Architecture and Organization, P.Chakraborty.
3. Microprocessor Architecture, Programming and Applications with the 8085by Ramesh S Gaonkar

Reference Books

1. Computer Architecture and Organization, William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003.
2. Computer Organization and Architecture, Linda Null, Julia Lobur, Narosa Publications ISBN81- 7319-609-5
3. Computer System Architecture", John. P.Hayes.

MSCS1.4 OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Course Objectives:

- This subject will help to improve the analytical skills of object-oriented programming
- Overall development of problem solving and critical analysis
- Formal introduction to Java programming language

Course Outcome:

On successful completion of this course, the student should be able to:

- Show competence in the use of the Java programming language in the development of small to medium-sized application programs that demonstrate professionally acceptable coding and performance standard
- Understand the basic principles of the object-oriented programming
- Demonstrate an introductory understanding of graphical user interfaces, multi-threaded programming, and event-driven programming.

SYLLABUS

Introduction to Java: Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java.

Objects and Classes: Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference

Inheritance and Polymorphism: Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.

Event and GUI programming: Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing

I/O programming: Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files.

Multithreading in java: Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java, Introduction to JavaBeans and Network Programming.

Java Database Connectivity (JDBC): JDBC Product, Types of Drivers, Two-Tier Client/Server Model, Three-Tier Client/Server Model, Basic Steps of JDBC, Creating and Executing SQL Statement, The Result Set Object, Working with Database MetaData Interface

Reference Books:

1 Introduction to Java Programming (Comprehensive Version), Daniel Liang, Seventh Edition, Pearson.

2 Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.

3 Murach’s Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD.

4 Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education.

5 The Complete Reference, Java 2 (Fourth Edition), Herbert Schild, TMH.

6 Java Programming, D. S. Malik, Cengage Learning.

MSCS1.5 DATABASE MANAGEMENT SYSTEMS

Course Objectives:

- To learn the evolution of DBMS Versus File systems, data models, and layers of abstraction.
- To understand conceptual and physical aspects of database design.
- To learn formal and commercial query language specifications.
- To understand concurrency control, recovery management, and other related issues.

Course Outcomes:

- The student will understand ER-modelling for conceptual database design and relational model.
- The student is introduced to formal and commercial query languages: Relational Algebra, calculus and SQL.
- The student will learn schema refinement and normalization.
- The student understands locking protocols concurrency control, and crash recovery methods.

SYLLABUS

Introduction: File system versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, The Relational model, Levels of abstraction, Data Independence, Transaction management, Structure of a DBMS.

Introduction to Database Design and The Relational Model: Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships & Relationship Sets, Additional Features of the ER Model, Conceptual Design with ER Model, Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/ Altering Tables and Views.

Relational Algebra and SQL: Preliminaries, Relational Algebra, The form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Embedded SQL, Dynamic SQL, JDBC.

Database Design: Schema Refinement and Normal Forms, Introduction to Schema Refinement, Functional Dependencies, Reasoning about FD’s, Normal Forms, Properties of Decomposition, Normalization, Other kinds of Dependencies.

Transaction Management: The ACID Properties, Transactions & Schedules, Concurrent Execution of Transactions, Lock-Based Concurrency Control.

Concurrency Control: 2PL, Serializability and Recoverability, Introduction to Lock Management, Lock Conversions, Dealing with Deadlocks, Specialized Locking Techniques, Concurrency Control without Locking.

Crash Recovery: Introduction to ARIES, The Log, Other Recovery-Related Structures, The Write-Ahead Log Protocol, Check pointing, Recovering from a System Crash, Media Recovery.

Text Books:

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGraw-Hill.

Reference:

1. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

MSCS 1.6 Data Structures & Algorithms Lab using C++/JAVA

1) Write a program in C++ to perform the following operations:

   a) Construct a binary search tree of elements.

   b) Search for a key element in the above binary search tree.

   c) Delete an element from the above binary search tree

2) Write a program in C++ that uses both a stack and a queue to test whether the given string is a palindrome or not.
3) Write a program in C++ to implement tree traversals.
4) Write a program in C++ to implement circular single linked list
5) Write a program in JAVA that use both recursive and non-recursive functions for implementing the following searching methods: a) Linear search b) Binary search
6) Write a program in JAVA to implement graph traversals(BFS,DFS)
7) Write a program in JAVA to implement Stack ADT using a singly linked list.
8) Write a program in JAVA to implement Queue ADT using a singly linked list.

MSCS1.7 COMPUTER ORGANIZATION & ARCHITECTURE LAB

Course Objectives

- to design and analyse the operational behaviour of IC gates, multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- to implement assembly language programming using various trainers.
- to make students familiar with Pentium class PC architecture.

Course Outcomes

After completion of the course the student should be able to:

- analyse the operational behaviour of various digital logic units such as multiplexers, decoders, flip-flops, counters, shift registers, binary adders and subtractors and ALU.
- write assembly language code using various trainers.
- understand Pentium class PC architecture.

SYLLABUS

I - Cycle: Digital Logic Design Experiments

TTL Characteristics and TTL IC Gates

Multiplexers & Decoders

Flip-Flops

Counters

Shift Registers

Binary Adders & Subtractors

A L U

II - CYCLE: 8085 Assembly Language Programming

8085 Assembly Language Programming according to theory course microprocessors-I using the following trainers:

Keyboard Monitor of 8085µP Trainer

Serial Monitor of 8085µP Trainer with Terminal

8085 Line Assembler of 8085µP Trainer with PC as Terminal

8085 Cross Assembler using In-Circuit Emulator (ICE) with 8085µP Trainer and PC as Terminal

Graded Problems are to be used according to the syllabus of computer organizationPentium class pc architecture familiarization hardware & software parts demonstration

Reference Books

1. Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept.2008
2. Microprocessor Architecture, Programming and Applications with the 8085 by Ramesh S Gaonkar.

MSCS1.8 DATABASE MANAGEMENT SYSTEMS LAB

Course Objectives

- To introduce to a commercial DBMS such as ORACLE.
- To learn and practice SQL commands for schema creation, data manipulation.
- To learn conceptual and physical database design based on a case study.
- To apply database design stages by studying a case study.

Course Outcomes

By the end of the course, the student should be able to:

- The student is exposed to a commercial RDBMS environment such as ORACLE.
- The student will learn SQL commands for data definition and manipulation.
- The student understands conceptual through physical data base design.
- The student takes up a case study and applies the design steps.

SYLLABUS

Features of a commercial RDBMS package such as ORACLE/DB2, MS Access, MYSQL & Structured Query Language (SQL) used with the RDBMS.

I. Laboratory Exercises Should Include:

a. Defining Schemas for Applications,
b. Creation of Database,
c. Writing SQL Queries,
d. Retrieve Information from Database,
e. Creating Views
f. Creating Triggers
g. Normalization up to Third Normal Form
h. Use of Host Languages,
i. Interface with Embedded SQL,
j. Use of Forms
k. Report Writing

II. Some sample applications are given below:

1. Accounting Package for Shops,

2. Database Manager for Magazine Agency or Newspaper Agency,
3. Ticket Booking for Performances,
4. Preparing Greeting Cards & Birthday Cards
5. Personal Accounts - Insurance, Loans, Mortgage Payments, Etc.,
6. Doctor's Diary & Billing System
7. Personal Bank Account
8. Class Marks Management
9. Hostel Accounting
10. Video Tape Library,
11. History of Cricket Scores,
12. Cable TV Transmission Program Manager,
13. Personal Library.
14. Sailors Database
15. Suppliers and Parts Database

Reference Books

1. Database Management Systems; Raghu Ramakrishnan, Johannes Gehrke 4th Edition, McGrawHill
2. Database System Concepts; A. Silberschatz, H. Korth 5th Edition, McGraw-Hill

M.Sc(CS) Wef 2024-2025 Admitted Batch

1st Year II SEMESTER

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MSCS 2.1	Formal Languages & Automata Theory	4	--	70	30	100	4
MSCS 2.2	Datawarehouse & Data Mining	4	--	70	30	100	4
MSCS 2.3	Data Communications & Computer Networks	4	--	70	30	100	4
MSCS 2.4	Internet of things	4	--	70	30	100	4
MSCS 2.5	Elective-I	4	--	70	30	100	4
MSCS 2.6	DataWarehouse & Data Mining Lab with R/ Python	--	3	50	50	100	2
MSCS 2.7	Data Communications & Computer Networks Lab	--	3	50	50	100	2
Total		**20**	**6**	**450**	**250**	**700**	**24**

Elective I: Big Data Analytics/ Image processing/ Embedded Systems

MSCS2.1 FORMAL LANGUAGES AND AUTOMATA THEORY

Course objectives:

- To introduce the concepts in automata theory and theory of computation to design grammars and recognizers for different formal languages.
- To employ finite state machines to solve problems in computing.
- To introduce finite state machines, context free grammars and Turing Machines and their properties as the basis for the formal expressivity of computer languages for solving linguistic decision problems.
- To understand the concepts of tractability and decidability, the concepts of NP-completeness and NP-hard problem and also the challenges for Theoretical Computer Science and its contribution to other sciences.

Course outcomes:

- Ability to think analytically and intuitively for problem-solving situations in related areas of theory in computer science
- Ability to describe the language accepted by an automata or generated by a regular expression or a context-free grammar;
- Ability to Understand the functioning of Finite-State Machines, Deterministic Finite-State Automata, Nondeterministic Finite-State Automata and Pushdown Automata and Turing Machines.

SYLLABUS

Introduction to Grammars and Languages: Definitions of alphabet, strings, language, grammar, types of grammar, types of machines, generation of languages from grammar, construction of grammar from the given description of languages, Chomsky Hierarchy of languages.

Finite State Machine (FSM): Definition of finite state machine, Representation of FSMs. Classification of FSM's and their construction, Conversion from NFA to DFA, Elimination of ε – transitions from NFA, Equivalence of two FSM's, optimization of finite state machine (Equivalence theorem method and Table filling method), Finite state machine with output: Moore and Mealy machines. Applications of FSM.

Regular Expression and Languages: Regular Expression, Finite Automata and Regular Expressions, Applications of Regular Expressions, Algebraic Laws for Regular Expressions, Properties of Regular Languages: Pumping Lemma for regular Languages, Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, Equivalence and Minimization of Automata.

Context Free Grammars and Languages: Context Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages, Normal Forms, Pumping Lemma for CFL, Closure properties of CFL, Decision properties for CFL.

Push down Automata: Definition of push down automata, The Languages of a PDA, push down automata, Equivalence of PDA's and CFG's, push down automata to context free grammar, context free grammar to push down automata, Deterministic Pushdown Automata.

Turing Machines: The Definition of Turing Machine, Turing Machine Model, Representation of Turing Machines, Language Acceptability by Turing Machines, Design of Turing Machines, Description of Turing Machines, Techniques for TM Construction, Variants of Turing Machines, Turing Machines and Type 0 Grammars.

Undecidability: A Language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE, Undecidable Problems About Turing Machines, Decidable & Undecidable Problems, Post Correspondence Problem.

Text books:

1. Introduction to automata theory, languages and computation, John.E.H.P croft/ Rajeev Motwani & JD Ullman—pearson education- III edition
2. Theory of computation, K.L.P.Mishra and N.Chandrasekhar, PHI

Reference Books:

1. Theory of computation, formal languages and automata theory, G P Saradhi Varma, B.Thirupathi Rao –Sci Tech publications.

MSCS2.2 DATA WAREHOUSING & DATA MINING

Course Objectives:

- To understand the evolution of data warehousing and data mining systems
- To understand extracting, cleaning and transformation of data into a warehouse.
  - To learn the principles of statistics, information theory, machine learning and other areas AI and implementation of data mining techniques.
- To understand pattern mining using classification and clustering methods.

Course Outcomes:

- The student understands the differences between OLTP and OLAP.
  - The student learns how data cube technology supports summarization and querying high dimensional data.
  - The student is introduced to similarity, distance, information gain and other performance and error metrics used for evaluation of mining results.
  - The student is introduced to various approaches to association rule mining, supervised and unsupervised learning and the corresponding classification and clustering approaches involving decision trees, Bayesian approaches, model based and agglomerative approaches.

Syllabus:

Introduction to Data Mining: Importance of Data Warehousing and Data Mining, Kinds of Patterns, Technologies, Applications, Major Issues in Data Mining, Data Objects and Attributes Types, Statistical Descriptions of Data, Estimating Data Similarity and Dissimilarity

Data exploration and pre-processing: Data Visualization, Quality data, Data Cleaning, Data Integration, Data Reduction, Data Transformation, Discretization and Concept Hierarchy Generation.

Data Warehouse and OLAP Technology: Basic Concepts of Data warehouse, Data Modelling using Cubes and OLAP, DWH Design and usage, Implementation using Data Cubes and OLAPs, Data Generalization with AOI.

Data Cube Technology: Preliminary Concepts of Data Cube Computation, Data Cube Computation Methods: Multi-way Array Aggregation for Full Cube, BUC, Star-cubing, Pre-computing shell fragments for High dimensional OLAP

Mining Frequent Patterns Based on Associations and Correlations: Basic Concepts, Frequent Item set Mining Methods: Apriori Algorithm, Association Rule Generation, Improvements to A Priori, FP- Growth Approach, Pattern Evaluation Methods

Classification &Prediction: Basic Concepts, Decision Tree Induction, Bayes Classification, Rule- Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Classification by Back Propagation, K-nearest neighbor classifier.

Cluster Analysis: Basic Concepts and issues in clustering, Types of Data in Cluster Analysis, Partitioning Methods, Hierarchical Methods, DBSCAN, Grid Based Methods, Evaluation of Clustering Solutions

Text Books:

1. Data Mining- Concepts and Techniques by Jiawei Han, Micheline Kamber and Jian Pei– Morgan Kaufmann publishers –--3rd edition

2. Data Mining Techniques, A.K.Pujari, University Press

References:

1. Data mining concepts byTan, Steinbech, and Vipin Kumar - Pearson Edu

   Publishers.

MSCS2.3 Data Communications & Computer Networks

Course Objectives:

- To study basics of data communication systems.
- To study the various types of transmission media.
- To study the various hardware concepts related to data communications.
- To make the students understanding of basic requirements of network hardware, software and its architecture.

Course Outcomes:

- Ability to understand concepts related to data communication hardware and its interface.
- Ability to understand concepts related to Signal encoding techniques and multiplexing.
- The student must be able to understand the concepts related to MAC sub layer.
- Understand the concepts related to network and transport layer.

SYLLABUS

Introduction to Data Communications: A Communications Model, Network Models, Analog and Digital Data Transmission, Transmission Impairments.

Data Communication Interface: Asynchronous and Synchronous Transmission. Data Link Control Flow Control, Error Detection, Error Control, High-Level Data Link Control (HDLC).

Signal Encoding Techniques: Digital data to Digital signal, Digital to Analog Signal, Analog data to Digital Signal, and Analog Data to Analog signal.

Multiplexing: Frequency-Division Multiplexing, Synchronous Time-Division Multiplexing: Characteristics, Digital Carrier Systems Statistical Time-Division Multiplexing: Characteristics.

Medium Access Control Sublayer: Wireless LAN’s:802.11Architecture and Protocol Stack, 802.11Frame structure.

Network Layer: Network Layer Design Issues, Shortest path routing algorithm, Congestion Control Algorithms, IP Protocol, IP Address.

Transport layer: Transport Service, Elements of Transport Protocols, TCP and UDP Protocols, Simple Network Management Protocol(SNMP).

Text Books:

1. Data Communications and Networking, Behrouz A Forouzan, Tata McGraw-Hill Co Ltd, Second Edition, ISBN: 0-07-049935-7

2. Computer Networks, Andrews S Tanenbaum, 5th Edition, Pearson Edu.

References:

1. Data and Computer Communications, Eighth Edition, William Stallings, Pearson Education, Inc.

MSCS2.4 INTERNET OF THINGS

Course Objectives:

- Vision and Introduction to Internet of Things(IoT).
- Understand IoT Market perspective.
- Data and Knowledge Management and use of Devices in IoT Technology.
- Understand State of the Art – IoT Architecture.
- Understand Real World IoT Design Constraints, Industrial Automation and Commercial.

Course Outcomes (COs):

At the end of the course, student will be able to

- Explain in a concise manner how the general Internet as well as Internet of Things work.
- Understand constraints and opportunities of wireless and mobile networks for Internet of Things.
- Use basic sensing and measurement and tools to determine the real-time performance of network of devices.
- Develop prototype models for various applications using IoT technology.

SYLLABUS

The Internet of Things: An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

Business Models for Business Processes in the Internet of Things ,IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services /Business

Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology,Sensing the World.

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education

Internet of Things, A.Bahgya and V.Madisetti, Univesity Press,2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally,Wiley

Getting Started with the Internet of Things,CunoPfister , Oreilly

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MSCS2.7 DATA COMMUNICATIONS & COMPUTER NETWORKS LAB

Course Objectives

1. This course provides students with hands on training regarding the design, troubleshooting, modelling and evaluation of computer networks.
2. To study the various hardware concepts related to data communications
3. To make the students understanding of basic requirements of network hardware, software and its architecture.

Course Outcomes:

1. Students learn about networking computers
2. How to setup Local Area Network using packet tracer software.
3. Students able to going to experiment in a real tested networking environment, and learn about network design and troubleshooting topics and tools,
4. Students learn and simulator Error control and flow control teaching
5. Students able to write socket program and client server applications.

Syllabus

Module I: Packet tracer software

1. Study of different types of Network cables and practically implement the cross-wired cable and straight through cable using clamping tool.
2. Connect the computers in Local Area Network.
3. Study of basic network command Network configuration commands.
4. Configure a Network topology using packet tracer software.

Module II: Network simulator (NS)

1. Implementation of Error Detection/Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Study of Socket Programming and Client-Server model using Java
6. Write a socket program for Echo/Ping/Talk commands using Java
7. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS

MSCS2.5 BIG DATA ANALYTICS

Course Objectives:

This course is aimed at enabling the students to

- Provide an overview of an exciting growing field of big data analytics.
- Introduce the tools required to manage and analyse big data like Hadoop, NoSQL, Map Reduce, HIVE, Cassandra, Spark.
- Teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability.
- Optimize business decisions and create competitive advantage with Big Data analytics

Course Outcomes:

After the completion of the course, student will be able to

- Illustrate on big data and its use cases from selected business domains.
- Interpret and summarize on NoSQL, Cassandra
- Analyze the HADOOP and Map Reduce technologies associated with big data analytics and explore on Big Data Applications Using Hive.
- Make use of Apache Spark, RDDs etc. to work with datasets.
- Assess real time processing with Spark Streaming.

SYLLABUS

Introduction big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.

Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schema less databases, materialized views, distribution models, sharding, master-slave replication, peer- peer replication, sharding and replication, consistency, relaxing consistency, version stamps, Working with Cassandra, Table creation, loading and reading data.

Data formats, analyzing data with Hadoop, scaling out, Architecture of Hadoop distributed file system (HDFS), fault tolerance with data replication, High availability, Data locality , Map Reduce Architecture, Process flow, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization.

Introduction to Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, Logical joins, Window functions, Optimization, Table partitioning, Bucketing, Indexing, Join strategies.

Apache spark- Advantages over Hadoop, lazy evaluation, In memory processing, DAG, Spark context, Spark Session, RDD, Transformations- Narrow and Wide, Actions, Data frames, RDD to Data frames, Catalyst optimizer, Data Frame Transformations, Working with Dates and Timestamps, Working with Nulls in Data,

Working with Complex Types, Working with JSON, Grouping, Window Functions, Joins, Data Sources, Broadcast Variables, Accumulators, Deploying Spark- On-Premises Cluster Deployments, Cluster Managers- Standalone Mode, Spark on YARN, Spark Logs, The Spark UI- Spark UI History Server, Debugging and Spark First Aid

Spark-Performance Tuning, Stream Processing Fundamentals, Event-Time and State full Processing - Event Time, State full Processing, Windows on Event Time- Tumbling Windows, Handling Late Data with Watermarks, Dropping Duplicates in a Stream, Structured Streaming Basics - Core Concepts, Structured Streaming in Action, Transformations on Streams, Input and Output.

Text Books:

1. Big Data, Big Analytics: Emerging, Michael Minnelli, Michelle Chambers, and AmbigaDhiraj
2. SPARK: The Definitive Guide, Bill Chambers &MateiZaharia, O'Reilley, 2018Edition
3. Business Intelligence and Analytic Trends for Today's Businesses", Wiley,2013
4. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World Polyglot Persistence", Addison-Wesley Professional,2012
5. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley,2012

Reference Books:

1. "Hadoop Operations", O'Reilley, Eric Sammer,2012
2. "Programming Hive", O'Reilley, E. Capriolo, D. Wampler, and J. Rutherglen,2012
3. "HBase: The Definitive Guide", O'Reilley, Lars George,2011
4. "Cassandra: The Definitive Guide", O'Reilley, Eben Hewitt,2010
5. "Programming Pig", O'Reilley, Alan Gates,2011

MSCS2.5 DIGITAL IMAGE PROCESSING

Course objectives

- To explain fundamentals of Image processing concepts.
- To provide mathematical foundation of image enhancement, image compression and image segmentation.
- To explain the students about Morphology and its applications in image processing.
- To explain various methods and techniques for image transformation.

Course outcomes

By the end of the course, the student should obtain:

- Ability to develop algorithms for fundamental concepts in Image processing.
- Ability to perform image enhancement, image compression and image segmentation using various methods.
- Ability to implement Image transformation techniques

SYLLABUS

Fundamentals of Image Processing: Image Acquisition, Image Model, Sampling,

Quantization, Relationship Between Pixels, Distance Measures, Connectivity, Image

Geometry, Photographic Film. Histogram: Definition, Decision Of Contrast Basing On Histogram, Operations Basing on Histograms Like Image Stretching, Image Sliding, Image Classification. Definition and Algorithm of Histogram Equalization.

Image Enhancement in Spatial Domain: Arithmetic and Logical Operations, Pixel or Point Operations, Size Operations; Smoothing Filters-Mean, Median, Mode Filters – Comparative Study.

Edge enhancement in spatial domain: Edge enhancement filters, Directorial Filters,

Sobel, Laplacian, Robert, KIRSCH Homogeneity & DIFF filters, PREWITT Filter, Contrast based edge enhancement techniques, Comparative study, Low pass filters, High pass filters, Sharpening filters, Comparative study, Color fundamentals and color model

Image Compression: Run Length Encoding, modified run length encoding, Contour

Coding, Huffman Code, Compression Due to Change in Domain, Compression Due to Quantization Compression at the Time of Image Transmission. Brief Discussion on: - Image Compression Standards.

Image Segmentation: Definition of segmentation, Characteristics of Segmentation,

Detection of Discontinuities, Thresholding. Pixel Based Segmentation Method. Region

Based Segmentation Methods, Segmentation by Pixel Aggregation, Segmentation by Sub Region Aggregation, Histogram Based Segmentation, Spilt and Merge Technique, Segmentation of moving objects.

Morphology: Dilation, Erosion, Opening, Closing, Hit-And-Miss Transform, Thinning, Thickening, Skeletons, Pruning Extensions to Gray – Scale Images Application of Morphology in I.P

Image Transforms: A Detail Discussion On Fourier Transform, DFT, FFT, Properties of

Fourier transform, WALSH Trans Form, WFT, HADAMARD Transform, DCT Image

Enhancement in Frequency Domain: Design of Low Pass, High Pass, EDGE

Enhancement, Smoothening Filters in Frequency Domain. Butter Worth Filter, Homomorphic Filters in Frequency Domain Advantages of Filters in Frequency Domain, Comparative Study of Filters in Frequency, Domain and Spatial Domain.

Text Book:

1. Digital Image Processing, Rafael C. Gonzalez and Richard E. Woods, Addision Wesley

Reference Books:

1. Fundamentals Of Electronic Image Processing By Arthyr – R – Weeks, Jr.(PHI)
2. Image Processing, Analysis, And Machine Vision By Milan Sonka Vaclan Halavac Roger Boyle, Vikas Publishing House.
3. Digital Image Processing, S. Jayaraman, S. Esakkirajan& T. Veera Kumar, TMH
4. Fundamentals of Digital Image Processing, Chris Solomon, Tobi Breckon, WileyBlackwell

MSCS2.5 EMBEDDED SYSTEMS

Course Objectives:

- To study the basics of embedded systems and its examples.
- To study the 8051 Microcontroller architecture and its instruction set.
- To discuss various software architectures in embedded systems.
- To discuss Inter Task Communication procedures in RTOS and design issues of RTOS.
- To study various embedded software development tools and debugging techniques.

Course Outcomes:

- Student will be understanding the basic architecture of 8051 micro controllers.
- ability to write ALP programs using 8051 instruction set.
- Ability to understand the concepts related to RTOS and its Inter Task Communication methods.
- Ability to understand various design issues of RTOS.
- Understand about embedded software development tools.

SYLLABUS

Introduction to Embedded Systems: Examples, Typical Hardware, Memory, Microprocessors, Busses; Introduction to 8051 Microcontroller, Architecture, Instruction set, Programming. Interrupts: Interrupt Basics, Shared-Data problem, Interrupt Latency.

Software Architectures: Round-Robin Architecture, Round-Robin with Interrupts Architecture, Function-Queue Scheduling Architecture, Real-Time Operating Systems Architecture, Selection of Architecture.

Real Time Operating System: Tasks and Task States, Tasks and Data, Semaphores and Shared Data, Semaphore Problems, Semaphore variants.

Inter Task Communication: Message Queues, Mailboxes, Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in RTOS Environment.

Design issues of RTOS: Principles, Encapsulation Semaphores and Queues, Hard Real-time Scheduling Considerations, Saving Memory Space, Saving Power.

Embedded Software Development Tools: Host and Target Machines, Linker/Locator for Embedded Software, Getting Embedded Software into the Target System.

Embedded Software Debugging Techniques: Testing on your Host Machine, Instruction Set Simulators, Laboratory Tools used for Debugging.

Introduction to the Internet of Things: History of IoT, IoT Architecture, M2M – Machine to Machine, Web of Things, IoT protocols, The Layering concepts, IoT Communication Pattern, IoT protocol Architecture.

Text Books:

1. The 8051 Microcontroller Architecture, Programming & Applications, Kenneth J. Ayala, Penram International.

An Embedded Software Primer, David E. Simon, Pearson Education, 2005.

Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, Marina Ruggieri & Homayoun Nikookar, River Publishers Series in Communications.

Reference Book:

1. Embedded Systems: Architecture, Programming and Design, Raj Kamal, Tata McGraw- Hill Education, 2008

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M.Sc(CS) Wef 2024-2025 Admitted Batch

2nd year I SEMESTER

Code	Name of the subject	Periods/week		Max. Marks		Total	Credits
		Theory	Lab	Ext.	Int.		
MSCS 3.1	Object Oriented Software Engineering	4	--	70	30	100	4
MSCS 3.2	Cryptography & Network Security	4	--	70	30	100	4
MSCS 3.3	Elective - II	4	--	70	30	100	4
MSCS 3.4	Elective III	4	--	70	30	100	4
MSCS 3.5	MOOCS-I		--	--	--	100	2
MSCS 3.6	OOSE Lab	--	3	50	50	100	2
MSCS 3.7	Network Security Lab	--	3	50	50	100	2
MSCS 3.8	Seminar on Advanced Topics	--	--	--	--	--	3
Total		**16**	**6**	**450**	**250**	**700**	**25**

Elective II : web technologies/ Mobile Computing/ Block chain Technology

Elective III: Machine learning/ Operations Research/ Cloud Computing

MOOCS-I :

Each student should learn any one of the following topics by registering for courses through Online instruction from standard e-learning portals like nptel, coursera, etc. and write the examination conducted as per the university norms.

List of topics for MOOCS-I:

Advanced Computer Networks/ R Programming for Data Analytics/ Data Visualization using Tableau/ MongoDB for Developers/ DevOps/Agile Technologies for Software Development/ Data Science

MSCS3.1 Object Oriented Software Engineering

Course objectives:

- To explain the importance of OOSE in Software development.
- To explain the students the importance of Requirements Engineering.
- To explain the role of UML and Testing in Software Development.
- To explain the entire Software Development Process with aid of case studies.

Course Outcomes:

- Ability to define a problem and perform Requirements Engineering.
- Ability to draw UML diagrams for the requirements gathered.
    - Ability to implement the designed problem in Object Oriented Programming Language and
- test whether all the requirements specified have been achieved or not.

Syllabu

Introduction to Object Oriented Software Engineering: Nature of the Software, Types of Software, Software Engineering Projects, Software Engineering Activities, Software Quality, Introduction to Object Orientation, Software Process Models-Waterfall Model, Opportunistic Model ,Phased Released Model, Spiral Model, Evolutionary Model, Concurrent Engineering Model

Requirements Engineering: Domain Analysis, Problem Definition and Scope, Requirements Definition, Types of Requirements, Techniques for Gathering and Analyzing Requirements, Requirement Documents, Reviewing, Managing Change in Requirements.

Unified Modelling Language & Use Case Modelling: Introduction to UML, Modelling Concepts, Types of UML Diagrams with Examples; User-Centred Design, Characteristics of Users, Developing Use- Case Models of Systems, Use-Case Diagram, Use- Case Descriptions, Basics of User Interface Design, Usability Principles, User Interfaces.

Class Design and Class Diagrams: Essentials of UML Class Diagrams, Associations and Multiplicity, Other Relationships, Generalization, Instance Diagrams, Advanced Features of Class Diagrams, Interaction and Behavioural Diagrams: Interaction Diagrams, State Diagrams, Activity Diagrams, Component and Deployment Diagrams.

Software Design and Architecture: Process of Design, Principles Leading to Good Design, Techniques for Making Good Design Decisions, Good Design Document; Pattern Introduction, Design Patterns: Abstraction-Occurrence Pattern, General Hierarchical Pattern, Play-Role Pattern, Singleton Pattern, Observer Pattern, Delegation Pattern, Adaptor Pattern, Façade Pattern, Immutable Pattern, Read-Only Interface Pattern and The Proxy Pattern; Software Architecture Contents of Architecture Model, Architectural Patterns: Multilayer, Client-Server, Broker, Transaction Processing, Pipe& Filter and MVC Architectural Patterns

Software Testing: Overview of Testing, Testing Concepts, Testing Activities, Testing Strategies, Unit Testing, Integration Testing, Function Testing, Structural Testing, Class Based Testing Strategies, Use Case/Scenario Based Testing, Regression Testing, Performance Testing, System Testing, Acceptance Testing, Installation Testing, OOTest Design Issues, Test Case Design, Quality Assurance, Root Cause Analysis, Post-Mortem Analysis.

Software Process Management: Introduction to Software Project Management, Rationale Management, Configuration Management, Activities of Software Project Management, Structure of Project Plan, Software Engineering Teams, Software Cost Estimation, Project Scheduling, Tracking and Monitoring.

CASE STUDY:

1. Simple Chat Instant Messaging System
2. GPS Based Automobile Navigation System
3. Waste Management Inspection Tracking System(WMITS)
4. Geographical Information System

Text Books:

1. Object-Oriented Software Engineering Practical software development using UML and Java

   by Timothy C. Leth bridge& Robert, Langaniere Mcgraw-Hill

2. Software Engineering, K.K. Agarwal, New Age Publications2008

3. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and

   Allen H. Dutoit, 2nd Edition, Pearson Education Asia.

Reference:

1. Software Engineering: A Practitioner's Approach, Roger S Pressman.

   2. A Practical Guide to Testing Object-Oriented Software, John D. McGregor; David A.Sykes, Addison-Wesley Professional.

MSCS3.2 CRYPTOGRAPHY & NETWORK SECURITY

Course Objectives:

- Introduction of the issues in network security- its need and importance, taxonomy and terminology.
- Discussion of various cryptographic techniques.
- Exploration of different types of security threats and remedies.
- Understanding of Internet security protocols and standards.

Course Outcomes:

- Realize the need and importance of network and data security in the Internet and in the distributed environments.
- Identify the different types of network security issues and their remedies.
- Application of various cryptographic tools and techniques in different contexts and as per need of security levels.
- Implementation of some Internet security protocols and standards.

Syllabus:

Overview: Computer Security Concepts, Threats, Attacks, and Assets, Security Functional Requirements, A Security Architecture for Open Systems, Computer Security Trends, Computer Security Strategy. Cryptographic Tools: Confidentiality with Symmetric Encryption, Message Authentication and Hash Functions, Public-Key Encryption, Digital Signatures and Key Management, Random and Pseudorandom Numbers, Practical Application: Encryption of Stored Data. User Authentication: Means of Authentication, Password-Based Authentication, Token-Based Authentication, Biometric Authentication, Remote User Authentication, Security Issues for User Authentication, Practical Application: An Iris Biometric System, Case Study: Security Problems for ATM Systems.

Access Control: Access Control Principles, Subjects, Objects, and Access Rights, Discretionary Access Control, Example: UNIX File Access Control, Role-Based Access Control, Case Study: RBAC System for a Bank. Database Security: The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security.

Malicious Software: Types of Malicious Software (Malware), Propagation—Infected Content—Viruses, Propagation—Vulnerability Exploit—Worms, Propagation—Social Engineering—SPAM E-mail, Trojans, Payload—System Corruption, Payload—Attack Agent—Zombie, Bots, Payload—Information Theft—Key loggers, Phishing, Spyware, Payload—Steal thing—Backdoors, Root kits, Countermeasures.

Denial-of-Service Attacks: Denial-of-Service Attacks, Flooding Attacks, Distributed Denial-of-Service Attacks, Application-Based Bandwidth Attacks, Reflector and Amplifier Attacks, Defenses Against Denial-of-Service Attacks, Responding to a Denial-of-Service Attack.

Intrusion Detection: Intruders, Intrusion Detection, Host-Based Intrusion Detection, Distributed Host-Based Intrusion Detection, Network-Based Intrusion Detection, Distributed Adaptive Intrusion Detection, Intrusion Detection Exchange Format, Honey pots, Example System: Snort. Firewalls and Intrusion Prevention Systems: The Need for Firewalls, Firewall Characteristics, Types of Firewalls, Firewall Basing, Firewall Location and Configurations, Intrusion Prevention Systems, Example: Unified Threat Management Products.

Buffer Overflow: Stack Overflows, Defending Against Buffer Overflows, Other Forms of Overflow Attacks, Software Security: Software Security Issues, Handling Program Input, Writing Safe Program Code, Interacting with the Operating System and Other Programs, Handling Program Output. Operating System Security: Introduction to Operating System Security, System Security Planning, Operating Systems Hardening, Application Security, Security Maintenance, Linux/Unix Security, Windows Security, Virtualization Security.

Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles, Data Encryption Standard, Advanced Encryption Standard, Stream Ciphers andRC4, Cipher Block Modes of Operation, Location of Symmetric Encryption Devices, Key Distribution. Public-Key Cryptography and Message Authentication: Secure Hash Function, HMAC, The RSA Public-Key Encryption Algorithm, Diffie-Hellman and Other Asymmetric Algorithms.

Internet Security Protocols and Standards: Secure E-mail and S/MIME, Domain Keys Identified Mail, Secure Socket Layer (SSL) and Transport Layer Security(TLS), HTTPS, IPv4 and IPv6 Security. Internet Authentication Applications: Kerberos, X.509, Public-Key Infrastructure, Federated Identity Management. Wireless Network Security: Wireless Security Overview, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security.

Text Book:

1. Computer Security - Principles and Practices (Except the Chapters 13, 14, 15, 16, 17,18, 19), 2nd Edition by William Stallings, Pearson Education, Inc.

Reference Books:

1. Cryptography and Network Security by William Stallings, Pearson Education Asia, New Delhi.
2. Network Security Essentials Applications and Standards, by William Stallings, Pearson Education Asia, NewDelhi.

MSCS3.6 Object Oriented Software Engineering Lab

Course objectives:

- The purpose of the Software Engineering Lab course is to familiarize the students with modern software engineering methods and tools, Rational Products. The course is realized as a project-like assignment that can, in principle, by a team of three/four students working full time. Typically the assignments have been completed during the semester requiring approximately 60-80 hours from each project team.
- The goal of the Software Engineering Project is to have a walk through from the requirements, design to implementing and testing. An emphasis is put on proper documentation. Extensive hardware expertise is not necessary, so proportionate attention can be given to the design methodology.
- Despite its apparent simplicity, the problem allows plenty of alternative solutions and should be a motivating and educating exercise. Demonstration of a properly functioning system and sufficient documentation is proof of a completed assignment.
- Term projects are projects that a group student or might take through from initial specification to implementation. The project deliverables include.

Course outcomes:

- Ability to define a problem and perform Requirements Engineering.
- Ability to draw UML diagrams for the requirements gathered.
    - Ability to implement the designed problem in Object Oriented Programming Language and
- test whether all the requirements specified have been achieved or not.

Projects:

1. Documentation including
    - A. A problem statement
    - B. A requirements document
        - a. A Requirements Analysis Document.
        - b. A System Requirements Specification.
        - c. A Software Requirements Specification.
2. A design document
    - A. A Software Design Description and a System Design Document.
3. A test specification.
4. Manuals/guides for
    - A. Users and associated help frames

B. Programmers

C. Administrators (installation instructions)

5. A project plan and schedule setting out milestones, resource usage and estimated costs.

6. A quality plan setting out quality assurance procedures

7. An implementation.

References:

1. Project-based software engineering: An Object-oriented approach, Evelyn Stiller, Cathie LeBlanc, Pearson Education

2. Visual Modelling with Rational Rose 2002 and UML, Terry Quatrini, Pearson Education

3. UML2 Toolkit, Hans -Erik Eriksson, etc; Wiley

MSCS3.7 CRYPTOGRAPHY & NETWORK SECURITY LAB

Course Objectives

- Understand encryption and decryption
- Understand various algorithm logic such as DES, Blowfish, Rijndael
- Understand how to find IP address, MAC address, neighbouring machines

Course Outcomes

By the end of the course, the student will be able to:

- Perform encryption and decryption using various algorithms
- Implement various algorithm logic
- Calculate message digest of a text
- Find IP address, MAC address, neighbouring machines
- Detect intrusion packets and demonstrate ARP poisoning

List of Experiments

Cycle 1 - Cryptography

1. Write a C program that contains a string (char pointer) with a value ‘Hello world’. The program should XOR each character in this string with 0 and displays the result.

2. Write a C program that contains a string (char pointer) with a value ‘Hello world’. The program should AND or and XOR each character in this string with 127 and display the result.

3. Write a Java program to perform encryption and decryption using the following algorithms

4. Ceaser cipher

5. Substitution cipher

6. Hill Cipher

7. Write a C/JAVA program to implement the DES algorithm logic.

8. Write a C/JAVA program to implement the Blowfish algorithm logic.

9. Write a C/JAVA program to implement the Rijndael algorithm logic.

10. Write the RC4 logic in Java Using Java cryptography; encrypt the text ‘Hello world’ using Blowfish. Create your own key using Java key tool.

11. Write a Java program to implement RSA algorithm.

12. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.

13. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

14. Calculate the message digest of a text using the MD5 algorithm in JAVA.

Cycle 2 - Network Security

1. a) Find the IP address, MAC address of your machine.

   b) Find the neighbouring machines in your network.

   c) Check if a server is up and running.

2. Run tcpdump/windump utility with atleast 4 options.

3. Capture the packets in your system using wireshark and analyse any one TCP packet in detail.

4. Use snort to detect intrusion packets.

5. Demonstrate ARP Poisoning.

Reference Books

1. Computer Security - Principles and Practices, 2ndEdition by William Stallings, Pearson Education, Inc.

2. Cryptography and Network Security by William Stallings, Pearson Education Asia, New Delhi.

MSCS3.3 WEB TECHNOLOGIES

Course Objectives:

On completing this course student will be able to

- Understand the principles of Web based application development.
- Design dynamic content in Web Pages using JavaScript.
- Understanding the concepts of java Servlets, java Server Pages and design applications using them.
- Understand the concepts of Component development and design applications by establishing connections to Databases

Course Outcomes:

- Students will be able to construct web based applications and Identify where data structures are appearing in them.
- Students will be able to connect java programs to different databases.
- Students will be able to develop EJB programs

SYLLABUS

Introduction to HTML, Core Elements, Links and Addressing, Images, Text, Colors and Background, Lists, Tables and Layouts, Frames, Forms , Cascading Style Sheets.

Introduction to Java Scripts, Elements of Objects in Java Script, Dynamic HTML with Java Script

Document type definition, XML Syntax, XML Schemas, Document Object model, Presenting XML, Using XML Processors

Introduction to Servlet, Servlet Life Cycles, Servlet Basics, Tomcat Web Server, Configuring Apache Tomcat, Handling Client Request and Response, Handling Cookies, Session Tracking.

Introduction to PHP, Language Basics, Functions, Strings, Arrays. Web Techniques, Data bases, Graphics, PDF, Dates and Times.

Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL- Representing Data Types: XML Schema-Communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files-Databases and Java Servlets.

MYSQL Installation, Accessing MySQL Using PHP, Form Handling, Cookies, Sessions, and Authentication,Tables, Inserting Data into Tables , Selecting Data from a Table,Updating Table , Deleting data from Table, Webpage creation.

Text Books:

1. Web Programming, building internet applications, 2nd Ed., Chris Bates, Wiley Dreamtech
2. The complete Reference HTML and DHTML, Thomas A. Powey
3. Learning Php, Mysql, Robin Nixon
4. Programming Php, Kevin Tatroe, Peter MacIntyre & Rasmus Lerdorf foreword by Michael Bourque.

Reference Books:

1. Internet , World Wide Web , How to program, Dietel , Nieto, PHI/PEA
2. Web Tehnologies, Godbole, kahate, 2nd Ed., TMH

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MSCS3.3 MOBILE COMPUTING

Course objectives

- To introduce the basic concepts and principles in mobile computing. This includes major techniques involved, and networks & systems issues for the design and implementation of mobile computing systems and applications.
- To explore both theoretical and practical issues of mobile computing.
- To provide an opportunity for students to understand the key components and technologies involved and to gain hands-on experiences in building mobile applications.

Course outcomes

On successful completion of course learner will be able:

- To identify basic concepts and principles in mobile communication & computing, cellular architecture.
- To describe the components and functioning of mobile networking.
- To classify variety of security techniques in mobile network.
- To describe and apply the concepts of mobility management

SYLLABUS

Basics of Android: Introduction to Android Operating System, Version of Android, Installing of software, Android example, Internal Details, Software Stack, Android Core Building Blocks, Android Emulator, AndroidManifest.xml, R.java file, Hide Title Bar, Screen Orientation.

User Interface Widgets: Working with Button, Toast, Custom Toast, Button, Toggle Button, Switch Button, Image Button, Check Box, Alert Dialog, Spinner, Spinner and other widgets, Auto Complete Text View, Rating Bar, Date Picker. Time Picker, Progress Bar, Activity life cycle and example, Intents-types, Fragment lifecycle and types.

Android Menu, Layouts and Views: Option Menu, Context Menu, Popup Menu, Types of layouts-Relative, Linear, Table, Grid. Types of views- Grid, Web, Scroll, Search, Tab Host, Dynamic List, Expanded List views.

Android services and Data storage: web service, Android services, Android Service API, lifecycle and examples. Shared preferences, Soap Vs Restful web service, , Internal storage, External storage, Sqlite Databases, Storing data into external oracle database.

Multimedia and Animation: Playing audio and video, creating audio player ,Alarm manager, gallery, Animation API, Drawable class, Rotate, Fade, Zoom animations, XML &JSON -XML Parsing SAX, XML Parsing DOM , XML Pull Parser , JSON Parsing.

Speech API and Telephony API, Web services: Text To Speech API, Example, managing speech and pitch, Speech to text. Telephony manager, Get calls state, call tracker, make phone call and send SMS, Email. Web Service introduction, SOAP vs RESTFUL web services, external oracle data base connections.

Content Providers and Notifications: Fundamentals of content providers, Content URI, Creation of custom content provider. Notification API, Notification Builder, Issuing notifications, Notification Compact builder, Examples

Text Book

1. Beginning Android 4 Application Development- WEI-MENG LEE, Wiley India Pvt.ltd

Reference Books

1. Introduction to Android Application Development: Android Essentials,4/E, Joseph Annuzzi, Jr.Lauren Darcey, Shane Conder, Pearson Education publishers
2. Professional Android 4 Application Development, Reto Meier, Wiley India Pvt.ltd
3. Android Application Development, Pradeep Kothari, Dreamtech publications
4. http://developer.android.com/guide/index.html

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MSCS3.3 BLOCKCHAIN TECHNOLOGY

Course Objectives:

- To understand the basic concepts block chain technology and to explore the driving force behind the crypto currency Bitcoin.
- To understand about the different methods of Decentralization using Block Chain and different Bitcoins and Alternative Coins.
- To understand about Ethereum and applications using Smart contracts and Block Chain Applications

Course Outcomes:

At the end of the course the student will be able to:

- Understand the types, benefits and limitation of block chain.
- Explore the block chain decentralization and cryptography concepts.
- Enumerate the Bitcoin features and its alternative options.
- Describe and deploy the smart contracts

SYLLABUS

BlockChain and its History: History of blockchain, Types of blockchain, Blockchain Components – Permissioned Blockchain Permission less Blockchain – Consortium Blockchain – basics of Consensus Algorithms, Architecture &amp; Properties of Blockchain.

Decentralization and Consensus Algorithms :Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations, Distributed systems, Distributed ledger, Merkle tree, structure of a block, Consensus

Algorithms- Proof of Work, Proof of Stack, Proof of Burn, Proof of Elapsed Time, Proof of Activity, Proof of Concept.

Bitcoin and Alternative Coins : Bitcoin, Transactions, Bitcoin payments , Bitcoin properties – Transaction life cycle – creation of coin –sending payments – double spending using blockchain – bitcoin anonymity – Ether: Ethercoin properties, Alternative Coins, Bitcoin limitations, Namecoin, Litecoin, Primecoin, Zcash

Ethereum and smart contracts: Ethereum Architecture, solidity programming basics, Smart Contract, Deploying Smart Contracts, Integration with UI.

Blockchain Applications : Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media ,Secure Voting and Digital Identity, Real Estate, Education

Textbooks:

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017
2. Bitcoin and Cryptocurrency Technologies, Author- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton University, 2016
3. Blockchain Technology, Author- Chandramouli Subramanian, Asha A George, Abhilash K A, Meena Karthikeyan,University Press (India) Private Limited, 2021

References:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Author- Daniel Drescher, Apress, First Edition, 2017

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MSCS3.4 MACHINE LEARNING

Course Objectives

- introduce students to the approaches to machine learning and related algorithms
- familiarize students with ideas of concept learning, version spaces and issues regarding data sources
- understand representation and learning using Decision Trees, Neural Networks, Genetic Algorithms
- introduce students to Bayesian approaches and key concepts of Expectation Maximization
- introduce students to inductive and analytical learning problems and related concepts of inductive bias, using prior knowledge to initialize the hypothesis.

Course outcomes

After completion of the course, the student should be able to:

- describe learning tasks and various approaches, algorithms in machine learning
- understand concept learning, version spaces and related concepts of bias-free learning and active queries
- represent and formulate problems in Decision Trees, Neural Networks, Genetic Algorithms
- understand the basics of Bayes theorem and key concepts of Expectation Maximization in Bayesian approaches.

SYLLABUS

Introduction to Machine Learning, Applications of Machine learning, Supervisory Learning: Learning classes from examples, Vapnik-Charvonenkis (VC) Dimension, Probably Approximately Correct(PAC) Learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of supervised machine learning algorithms

Bayesian Decision Theory: Classification, losses and risks, discriminant functions, utility theory, value of information, Bayesian networks, Influence diagrams, Association rules, Parametric Methods: Maximum likelihood estimation, evaluating an estimator with bias and variance, Bayes' estimator, parametric classification, regression, tuning model complexity: bias vs variance dilemma, model selection procedures

Multivariate methods: Multivariate data, parameter estimation, missing value imputation, univariate normal distribution and classification, discrete features, regression, Dimensionality Reduction: Subset selection, PCA, Factor Analysis, multi-dimensional scaling, LDA

Clustering: Mixture densities, K-means clustering, Expectation Maximization algorithm, mixtures of Latent Variable Models, Supervised learning after clustering, Hierarchical clustering, choosing number of clusters

Non-parametric methods: Non-parametric methods density estimation, generalisation to multivariate data, nonparametric classification, condensed nearest neighbors, non-parametric regression: smoothing models, choosing smoothing parameters

Decision trees and Linear Discrimination: Univariate classification and regression trees, rule extraction from trees, Multivariate trees, Generalizing linear model, two class and multi-class geometry of linear discriminant, pairwise separation, gradient descent, logistic discrimination for binary and multi-class problems, discrimination by regression, Support vector machines, optimal separating hyperplane, kernel functions for non-separable spaces, SVM for regression.

Hidden Markov Models: Discrete Markov processes, Hidden Markov Models, Three basic problems of HMM, Evaluation problem, finding the state sequence, Learning model parameters, continuous observations, Model selection in HMM Assessing and comparing classification Algorithms: Cross-validation and resampling methods, measuring error, interval estimation, hypothesis testing, assessing performance of a classifier, comparing two classification algorithms, comparing multiple classification algorithms based on variance

Text Book:

1. Introduction to Machine Learning by Ethem Alpaydin, Prentice-Hall of India, 2006

Reference books:

1. Machine Learning, Peter Flach, Cambridge University Press, 2012
2. Machine Learning, Tom Mitchell , McGraw Hill, 1997

MSCS3.4 OPERATIONS RESEARCH

Course Objectives

Upon completion of this course, you will be able to:

- Formulate a real-world problem as a mathematical programming model
- Implement and solve the model in EXCEL and LINDO
- Understand the theoretical workings of the simplex method for linear programming and perform iterations of it by hand
- Understand the relationship between a linear program and its dual, including strong duality and complementary slackness
- Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution as the data change
- Solve specialized linear programming problems like the transportation and assignment problems
- Solve network models like the shortest path, minimum spanning tree, and maximum flow problems
- Understand the applications of, basic methods for, and challenges in integer programming

Course Outcome:

After learning the course, the students should be able to:

- Students will be able to describe characteristics and scope of OR.
- Students will be able to define and formulate mathematical problems.
- Students will be able to select optimal problems solving techniques for a given problem using LP.
- Students will be able to formulate and solve transportation, travelling sales man and transshipment problems.
- Students will be able to formulate and solve optimization problems related to job/ work assignments.
- Students will be able to demonstrate and solve simple models of Game theory.
- Students will be able to evaluate optimum solution using dynamic programming for different applications.
- Students will be able to choose / devise appropriate queuing model for practical application.
- Students will be able to solve different problems related to Network

Overview of Operations Research: Types of OR Models, Phases of Operations Research– OR Techniques, Introduction to Linear Programming, Formulation of Linear Programming Problem, Graphical Solution; Graphical Sensitivity Analysis

Standard Form of LPP: Basic Feasible Solutions, Unrestricted Variables, Simplex Algorithm, Artificial Variables, Big M Method, Two Phase Simplex Method, Degeneracy, Alternative Optimal, Unbounded Solutions, Infeasible Solutions, Primal and Dual Problems and Their Relations, Dual Simplex Method

Transportation Problem: LPP, Initial Solutions, North West Corner Rule, Lowest Cost Method, Vogel's Approximation Method, Optimum Solutions of TPP, Degeneracy in Transportation, Transportation Algorithms

Assignment Problem: Assignment Problem as LPP, Hungarian Method, Travelling

Salesman Problem, Solutions of TSP, Sequencing Problems, N-Jobs Two Machine Problems, N Jobs K Machines Problems, Two-Jobs M- Machine Problems, Crew Scheduling Problems

Network Representation of a Project: CPM and PERT, Critical Path Calculations, Time – Cost Optimizations, PERT Analysis and Probability Considerations, Resource Analysis in Network Scheduling.

Replacement Problems: Individual and Group Replacement Policy, Reliability & System Failure Problems, Inventory-Factors Effecting Inventory-EOQ, Inventory Problems with and Without Shortages, Inventory Problems with Price Breakups, Multi Item Deterministic Problems. Probabilistic Inventory Problems

Game Theory: Two Person Zero Sum Games, Mixed Strategy Games and Their Algorithms.

Textbooks:

1. Operations Research, KantiSwaroop, P.K. Gupta, ManMohan,SulthanChand&Sons Education
2. Operations Research–An Introduction, HandyATaha–Pearson Education

References

1. Taha.H.A ,operation Research : An Introduction, McMilan publishing Co., 1982. 7 th ed.
2. Ravindran A, Philips D.T & Solbery.J.J, Operations Research: Principles and practice, John Wiley & Sons, New York, 1987.
3. Frank S. Budnick, Dennis Mcleavey and Richard Mojena, Principles of Operations Research for Management. All India Traveler Book seller, Delhi.
4. Gillet.B.E., Introduction to Operations Research - A Computer oriented algorithmic approach, McGraw Hill, 1987.
5. Joseph.G.Ecker & Michael Kupper Schimd, Introduction to operations Research, John Wiley & Sons, 1988.
6. Hillier.F.S & Liberman.G.J, operation Research, Second Edition, Holden Day Inc, 1974.
7. Kanti Swarup, Gupta.P.K. & Man Mohan, operations Research, S.Chand & Sons

MSCS3.4 CLOUD COMPUTING

Course Objectives:

- To import fundamental concepts in the area of cloud computing.
- To understand the concept of Virtualization and cloud data storage.
- To learn cloud Application Development and cloud Governance.
- To gain competence in Map Reduce and Hadoop Overview.

Course Outcomes:

By the end of the course, the student should be able to:

- Identify the architecture and infrastructure of cloud computing.
- Develop applications for cloud computing.
- Design and Implement a novel cloud computing application.

SYLLABUS

Introduction to cloud computing: Cloud computing components, Infrastructure services, storage applications, database services – introduction to Saas, Paas, Iaas, Idaas, data storage in cloud

Virtualization: enabling technologies, types of virtualization, server virtualization, desktop virtualization, memory virtualization, application and storage virtualization tools and products available for virtualization

SAAS and PAAS: Getting started with Saas, SaaS solutions, SOA , PaaS and benefits.

Iaas and Cloud data storage: understanding Iaas, improving performance for load balancing, server types within Iaas, utilizing cloud based NAS devices, cloud based data storage, and backup services, cloud based block storage and database services

Cloud Application development: Client server distributed architecture for cloud designing cloud based solutions, coding cloud based applications, traditional Apps vs cloud Apps, client side programming, server side programming overview-fundamental treatment of web application frameworks.

Cloud Governance and economics: Securing the cloud, disaster recovery and business continuity in the cloud, Managing the cloud, migrating to the cloud, governing and evaluating the clouds business impact and economics,

Inside Cloud: Introduction to Map Reduce and Hadoop-over view of big data and its impact on cloud

Text Books:

1. Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Kris Jamsa, Jones & Bartlett Publishers,Paper back edition, 2013
2. Cloud Computing: A Practical Approach,Anthony T .Velte, Toby J.Velte, Robert Elsenpeter, Tata McGraw Hill Edition

References:

1. Hadoop Map Reduce cookbook, SrinathPerera and Thilina Gunarathne, Packt publishing

M.Sc(CS) Wef 2024-2025 Admitted Batch

2nd year II SEMESTER

Code	NAME OF THE SUBJECT	MAXIMUM MARKS			CREDITS
		INTERNAL	EXTERNAL	TOTAL	
MSCS 4.1	PROJECT/ THESIS WORK	50	50	100	14
Total Credits (Complete Course)					89