

Department of Computer Science
KAKATIYA UNIVERSITY, WARANGAL

Syllabus of M.Sc. (CS) Programme with effect from AY 2023- 2024

M.Sc. (CS) I Year I Semester

Paper Code	Paper title	PPW	MARKS			Credits
			Internal	External	Total	
MSCCS111	Mathematical Foundations of Computer Science	04	20	80	100	04
MSCCS112	Python Programming	04	20	80	100	04
MSCCS113	Operating Systems	04	20	80	100	04
MSCCS114	Computer Networks	04	20	80	100	04
MSCCS115	Python Programming Lab	04	00	75	75	03
MSCCS116	Operating Systems Lab	04	00	75	75	03
MSCCS117	Computer Networks Lab	04	00	75	75	03
MSCCS118	Seminar	--	--	25	25	01
Total Marks					650	26

M.Sc. (CS) I Year II Semester

Paper Code	Paper title	PPW	MARKS			Credits
			Internal	External	Total	
MSCCS121	Computer Organization	04	20	80	100	04
MSCCS122	Web Application Development with PHP	04	20	80	100	04
MSCCS123	Data Mining	04	20	80	100	04
MSCCS124	Object Oriented Analysis and Design	04	20	80	100	04
MSCCS125	Web Application Development with PHP Lab	04	00	75	75	03
MSCCS126	Data Mining Lab	04	00	75	75	03
MSCCS127	OOAD Lab	04	00	75	75	03
MSCCS128	Seminar	--	--	25	25	01
Total Marks					650	26

M.Sc. (CS) II Year I Semester

Paper Code	Paper title	PPW	MARKS			Credits
			Internal	External	Total	
MSCCS211	Automata Theory and Formal Languages	04	20	80	100	04
MSCCS212	Web Technologies	04	20	80	100	04
MSCCS213 Elective - 1	a. Mobile Application Development b. Cloud Computing	04	20	80	100	04
MSCCS214 Elective - 2	a. Cryptography and Network Security b. Programming with R	04	20	80	100	04
MSCCS215	Web Technologies Lab	04	00	75	75	03
MSCCS216 Elective - 1 Lab	Mobile Application Development Lab / Cloud Computing Lab	04	00	75	75	03
MSCCS217 Elective - 2 Lab	Cryptography and Network Security Lab / Programming with R	04	00	75	75	03
MSCCS218	Seminar	--	--	25	25	01
Total Marks					650	26

M.Sc. (CS) II Year II Semester

Paper Code	Paper title	PPW	MARKS			Credits
			Internal	External	Total	
MSCCS221	Artificial Intelligence	04	20	80	100	04
MSCCS222 Elective - 3	a. Machine Learning b. Big Data Analytics	04	20	80	100	04
MSCCS223 Elective - 4	a. Mobile Computing b. Information Retrieval Systems	04	20	80	100	04
MSCCS224	Major Project	--	75	175	250	10
MSCCS225	Comprehensive Viva	--	--	75	75	03
MSCCS226	Seminar	--	--	25	25	01
Total Marks					650	26

M.Sc. (CS) I Year I Semester

Paper Code	Paper title	PPW	MARKS			Credits
			Internal	External	Total	
MSCCS111	Mathematical Foundations of Computer Science	04	20	80	100	04
MSCCS112	Python Programming	04	20	80	100	04
MSCCS113	Operating Systems	04	20	80	100	04
MSCCS114	Computer Networks	04	20	80	100	04
MSCCS115	Python Programming Lab	04	00	75	75	03
MSCCS116	Operating Systems Lab	04	00	75	75	03
MSCCS117	Computer Networks Lab	04	00	75	75	03
MSCCS118	Seminar	--	--	25	25	01
Total Marks					650	26

MSCCS111	Mathematical Foundations of Computer Science	PPW: 04
MFCS		Internal:20 External:80

UNIT - I

Set theory: Introduction, Basic Concepts of Set Theory, Representation of Discrete Structures, Relations and Ordering, Functions. Boolean algebra.

Mathematical logic: Introduction, Statements and Notation, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus.

UNIT - II

Propositional logic: Syntax, semantics, validity of formulas, satisfiable and unsatisfiable formulas, encoding and examining the validity of some logical arguments

Proof techniques: Proof by Induction, proof by contradiction, contra positive proofs, proof of necessity and sufficiency; first order Logic: Brief introduction; Basics of soundness and completeness.

UNIT - III

Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of generating functions, Recurrence relations, Solving recurrence relations by substitution and Generating functions, The method of Characteristic roots, Solutions of Inhomogeneous Recurrence Relations.

UNIT - IV

GRAPHS: Graphs, Isomorphism, Trees, Spanning trees, Binary trees, Planar graphs, Euler's Circuits, Hamiltonian graphs, Chromatic numbers, Four-color problem, Network flows.

Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Tremblay, R. Manohar, McGraw Hill education (India) Private Limited.
2. Discrete Mathematics for Computer Scientists & Mathematicians, Joe L. Mott, Abraham Kandel, Theodore P. Baker, Pearson , 2nd ed.

MSCCS112	Python Programming	PPW: 04
PYP		Internal:20 External:80

UNIT-I

Introduction: History of Python Features of Python, Python Installation, Variables in Python, Keywords and their usage, Operators, members operators, Identity Operators, Input-Output Statements, Indentation, Expressions and order of evaluations.

Conditional Statements: if, elif, else; Loops: for, while; break, continue, pass.

Functions: Positional arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions.

UNIT-II

Modules: Predefined modules along with the functions, importing modules, Creation of User defined modules, packages in python. **Exception Handling:**

try, catch, except, finally, else, raise, Handling different types of Exceptions.

File handling: Read and write operations on different types of files

UNIT-III

Object Oriented Programming in Python: Classes, Methods, Constructors, Inheritance, Overriding Methods, Data hiding. **Python data structures:** Strings, List, Tuples, Dictionaries, Sets (Creation, Access, Functions), Comprehensions.

Packages: Working with Numpy package, Pandas data structures: Series, Data Frames.

UNIT-IV

Data Input: Input from Text Files: Visual Inspection, Reading ASCII-Data into Python, Input from MS Excel. **Data types:** Categorical, Numerical. **Plotting data:**

scalar plots, bar charts, pie charts, line graphs, error plots, box plots, 3D plots

Statistics operations: Mean, Median, Standard deviation, Web frame work for python- different stack frame works, **Django package** - introduction and applications

Text Books :

1. Python Programming: A Modern Approach, VamsiKurama, Pearson
2. Python Data Science Handbook: Jake VanderPlas Orielly
3. Learning Python, Mark Lutz, Orielly

MSCCS113	Operating Systems	PPW: 04
OS		Internal:20 External:80

UNIT -I

Introduction: Operating System Structure- Layered structure, system components, operating system functions, Classification of Operating Systems- Batch, Time-sharing, Real-Time Systems, Multi user Systems, Multi-Processor System, Distributed Systems , Operating System services, System Boot, System Calls, Kernels, Virtualization. **Process Management:** Process concepts, Process State, Process Control Block (PCB), Cooperating Processes, and Inter Process Communication: Shared Memory, Message Passing, and Multithreaded Programming. **System call interface for process management:** fork, exit, wait, waitpid, exec.

UNIT- II

CPU Scheduling: Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling, **Process Synchronization:** Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Peterson's solution, Semaphores, Classical Problem in Concurrency- Bounded-Buffer Problem, Readers-Writers Problem, Dining Philosopher Problem, Sleeping Barber Problem **Deadlock:** System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

UNIT -III

Memory Management: Swapping, Multiprogramming with fixed partitions, dynamic partitions, Paging, Segmentation, Virtual Memory Concepts, Demand Paging, Page fault, Page Replacement Algorithms, Thrashing. Cache memory organization, Locality of reference.

UNIT- IV

Storage Management: File System: File attributes File operations, Access Methods, Directory Implementation, Allocation Methods, Free-Space Management, and Recovery I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID.

TEXT BOOKS:

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 9th Edition, John Wiley
2. Advanced programming in the UNIX environment, W.R.Stevens, Pearson education.

MSCCS114	Computer Networks	PPW: 04
CN		Internal:20 External:80

UNIT - I

Computer Networks and the Internet: What is the Internet? What is a Protocol? The Network Edge, The Network Core, Access Networks and Physical Media, ISPs and Internet Backbones, Delay and Loss in Packet-Switched Networks, Protocol Layers and Their Service Models, A Brief History of Computer Networking and the Internet. **Application Layer:** Principles of Application Layer Protocols, The World Wide Web: HTTP, File Transfer: FTP, Electronic Mail in the Internet, SMTP, DNS - The Internet's Directory Service, Socket Programming with TCP and UDP.

UNIT - II

Transport Layer: Transport-Layer Services and Principles, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Principles of Congestion Control.

UNIT - III

Network Layer And Routing: Network-Layer Services and Principles, Introduction and Network Service Models, Routing Principles and Routing Algorithms, Hierarchical Routing, Inter Protocol (IP) - IPv4 Addressing, Datagram Format, IPv6 Addressing and Format, Routing in the Internet, What's Inside a Router?

UNIT - IV

Link Layer And Local Area Networks: Data Link-Layer Services and Principles, Introduction, Error-Detection and Correction Techniques, Multiple Access Protocols, LAN Addresses and ARP, Ethernet, Hubs, Bridges, Switches, wireless Links: IEEE 802.11, Bluetooth, PPP: The Point-to-Point Protocol, Asynchronous Transfer Mode (ATM), X.25 and Frame Relay.

TEXT BOOKS:

1. Computer Networking A Top-Down Approach Featuring The Internet By - James F. Kurose And Keith W. Ross (Pearson)
2. Computer Networks By- Andrew S. Tanenbaum (Prentice Hall India)

MSCCS115	Python Programming Lab	PPW: 04
PYPL		External:75

1. Python installation and configuration with windows and Linux
2. Programs on understanding the data types, control flow statements, blocks and loops
3. Programs on understanding functions, use of built in functions, user defined functions
4. Programs to use existing modules, packages and creating modules, packages
5. Programs on implementations of all object-oriented concepts like class, method, inheritance, polymorphism etc. (Real time examples must be covered for the implementation of object-oriented concepts)
6. Programs for Pattern finding.
7. Programs covering all the aspects of Exception handling, user defined exception, Multithreading.
8. Programs demonstrating the IO operations like reading from file, writing into file from different file types like data file, binary file, etc.
9. Programs to perform searching, adding, updating the content from the file.
10. Basic programs with NumPy as Array, Searching and Sorting, date & time and String handling
11. Programs on series and data frames.
12. Programs to demonstrate data pre-processing and data handling with data frame
13. Program on data visualization.

Note:

1. All the programs that are practiced and executed must be written down in the practical record book.
2. In the external lab examination, the student must compile and execute at least two programs.
3. External Viva-voce is compulsory.

MSCCS116	Operating Systems Lab	PPW: 04
OSL		External:75

1. Use vi editor to create a file with some text and save the file.
2. Add and Delete content to the file created above.
3. Write programs that use the following processing utilities.
 - i. wc, od, cmp, comm, diff, head, tail, cut, paste, sort, grep, uniq
 - ii. Disk backup utilities
 - iii. du, df, tar, cpio, ps, who
4. Write a shell script to generate a multiplication table.
5. Write a shell script that copies multiple files to a directory.
6. Write a shell script which counts the number of lines and words present in a given file.
7. Write a shell script which displays the list of all files in the given directory.
8. Write a shell script (of small calculator) that adds, subtracts, multiplies and divides the given two integers.
9. Write a C program that counts the number of blanks in a text file.
 - i. Using standard I / O
 - ii. Using system calls.
10. Write a C program that illustrates how to execute two commands concurrently with a command pipe.
11. Write a C program that illustrates file locking using semaphores.
12. Write a C program that implements a producer-consumer system with two processes. (using semaphores)
13. Write a C program that illustrates inter process communication using shared memory system calls.
14. Write a C program that illustrates the following.
 - i. Creating a message queue
 - ii. Writing to a message queue.
 - iii. Reading from a message queue.
15. Write C programs to implement the various CPU Scheduling Algorithms
 - a. FCFS
 - b. SJF
 - c. Priority
 - d. Round Robin
16. Bankers Algorithm for Deadlock Avoidance
17. Implementation of Deadlock Detection Algorithm
18. Implementation of the following Memory Allocation Methods for fixed partition
 - a. First Fit
 - b. Worst Fit
 - c. Best Fit
19. Implementation of the following Page Replacement Algorithms
 - a. FIFO
 - b. LRU
 - c. LFU
20. Implementation of the following File Allocation Strategies
 - a. Sequential
 - b. Indexed
 - c. Linked

Note:

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3. External Viva-voce is compulsory.

MSCCS117	Computer Networks Lab	PPW: 04
CNL		External:75

The following experiments must be implemented using JAVA.

1. Implementation of Looking up internet address
2. Implementation of port scanner
3. Implementation of finger client
4. Implementation of ping programming.
5. Implementation of peer to peer communication using UDP
6. Implementation of socket program for UDP Echo Client and Echo Server
7. Implementation of Client Server Communication Using TCP
8. Implementation of Client server Application for chat
9. Implementation multicast programming
10. Implementation Client server Communication using object stream
11. Implementation Client server Communication using byte stream
12. Implementation of CRC
13. Implementation Message passing using Message Window
14. Implementation Message Passing using Group Window
15. Implementation of Online test for a Single Client.

Note:

1. All the programs that are practiced and executed must be written down in the practical record book.
2. In the external lab examination, the student must compile and execute at least two programs.
3. External Viva-voce is compulsory.

MSCCS118	Seminar	PPW: - -
SEM		External:25

- This course is meant to give students the practice of speaking in front of an audience and to explore topics of their own choosing in detail.
- Students must search topics and organize presentations for faculty and other students. The topics may be any aspect of the Computer Science and must be approved by the instructor in advance.
- To improve students speaking skills, each student must receive feedback from the fellow students and the instructor.

Expectations:

- Attendance at each seminar is mandatory for all students enrolled.
- In addition, students are expected to attend all other seminars in the department, such as invited guest speakers. It is expected that students will actively participate through an interaction with the speaker.
- The effort put-in by the students to meet these expectations will be considered in the determination of the final grade.

M.Sc. (CS) I Year II Semester

Paper Code	Paper title	PPW	MARKS			Credits
			Internal	External	Total	
MSCCS121	Computer Organization	04	20	80	100	04
MSCCS122	Web Application Development with PHP	04	20	80	100	04
MSCCS123	Data Mining	04	20	80	100	04
MSCCS124	Object Oriented Analysis and Design	04	20	80	100	04
MSCCS125	Web Application Development with PHP Lab	04	00	75	75	03
MSCCS126	Data Mining Lab	04	00	75	75	03
MSCCS127	OOAD Lab	04	00	75	75	03
MSCCS128	Seminar	--	--	25	25	01
Total Marks					650	26

MSCCS121	Computer Organization	PPW: 04
CO		Internal:20 External:80

UNIT - I

Basic Structure of Computer Hardware And Software: Functional units, Basic operational concepts, Bus structures, Software, Performance, Distributed Computing.

Logic Circuits: Basic Logic Functions, Synthesis of Logic Functions Using AND, OR, and NOT Gates, Minimization of Logic Expression, Synthesis with NAND and NOR Gates, Practical Implementation of Logic Gates, Flip-Flops, Registers and Shift Registers, Counters, Decoders, Multiplexers, Sequential Circuits. (Chapter 1, A.1 to A.13)

UNIT - II

Addressing Methods: Basic Concepts, Memory Locations, Main Memory Operations, Addressing Modes, Assembly Language, Basic I/O operations, Stacks and Queues, Subroutines. **Processing Unit:** Some Fundamental Concepts, Execution of a Complete Instruction, Hardwired Control, Performance Considerations, Micro Programmed Control, Signed Addition and Subtraction, Arithmetic and Branching Conditions, Multiplication of Positive Numbers, Signed-Operand, Integer Division, Floating-Point Numbers.(Chapter 2.1 to 2.83, 6.4 to 6.10)

UNIT - III

Input-Output Organization: Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, I/O Hardware, Standard I/O Interfaces, The Motorola 680X0

Family, The Intel 80X86 Family, The Power PC Family, The Alpha AXP Family, Architectural and Performance Comparisons, A Stack Processor. (Chapter 4, 8.1 to 8.6)

UNIT - IV

Memory: Semiconductor RAM memories, Read-Only Memories, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements. **Introduction To Computer Peripherals:** I/O Devices, On-Line Storage. (Chapter 5, 9.1, 9.2)

TEXT BOOK:

1. Computer Organization, Tmh (Iv Edition) By - V.C. Hamacher

MSCCS122	Web Application Development with PHP	PPW: 04
WADP		Internal:20 External:80

UNIT - I

Introducing PHP - What is PHP? Why use PHP? Evolution of PHP, Installing PHP, Other ways to run PHP, Creating your first script. PHP Language Basics - Using variables, Understanding Data Types, Operators and Expressions, Constants. Decisions and Loops - Making Decisions, Doing Repetitive Tasks with Looping, Mixing Decisions and Looping with HTML.

UNIT - II

Strings - Creating and Accessing Strings, Searching Strings, Replacing Text with Strings, Dealing with Upper and Lowercase, Formatting Strings. **Arrays** - Creating Arrays, Accessing Array Elements, Looping Through Arrays with foreach, Working with Multidimensional Arrays, Manipulating Arrays. **Functions** - What is a Function? Why Functions are useful? Calling Functions, Working with Variable Functions, Writing your own Functions, Working with References, Writing Recursive Functions.

UNIT - III

Objects - Introduction OOP Concepts, Creating Classes and Objects in PHP, Creating and using Properties, Working with Methods, Object Overloading with _get(), _set() and _call(), Using Inheritance to Extend Power of Objects, Constructors and Destructors, Automatically Loading Class Files, Storing as Strings. **Handling HTML Forms with PHP** - How HTML form works, Capturing Form Data with PHP, Dealing with Multi-Value Fields, Generating Web Forms with PHP, Storing PHP Variables in Forms, Creating File Upload Forms, Redirecting After a Form Submission.

UNIT - IV

Working with file and Directories: Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading.

Database Connectivity with MySql: Connecting MySQL from PHP. Retrieving Data from MySQL. **CRUID** - Create Retrieve, Update, Insert and Delete Operations with MySQL Database.

PHP with Sessions, Cookies: Introduction to Session Control, Session Functionality. What is a Cookie, Setting Cookies with PHP. Using Cookies with Sessions, Deleting Cookies, Registering Session variables, Destroying the variables and Session.

Working with FTP.

Text Book:

Matt Doyle, Beginning PHP 5.3 (Wrox - Wiley Publishing)

MSCCS123	Data Mining	PPW: 04
DM		Internal:20 External:80

UNIT - I

Data Mining- Data Mining Overview, Kinds of Data can be mined, Kinds of patterns can be mined, Data Mining Functionalities, Technologies used, Data Mining Applications, Major issues in Data Mining, Data objects and attribute types, Basic statistical descriptions of data, Measuring Data Similarity and Dissimilarity.

UNIT - II

Data Pre-Processing: Data Cleaning, Data Integration - Data reduction: Overview, Attribute subset selection, clustering, sampling, Data cube Aggregation, Histograms. Data Transformation and Data Discretization and concept Hierarchy Generation.

Data Warehouse: Basic Concepts, Data Warehouse modeling, Data Warehouse Design. Data Warehouse implementation- Data cube implementation overview and OLAP server architecture, Attribute oriented induction

UNIT - III

Basic Concepts of frequent patterns- Frequent Item sets, Mining methods, Apriori and FP-Growth, Association rules. **Classification and Prediction:** Classification by Decision Tree **Induction:** Information gain, Gini Index, Tree Pruning. **Classification methods:** Bayesian Classification, Rule Based Classification, **Model evolution and Selection:** Metrics for evaluating, Other Classification Methods

UNIT-IV

Cluster Analysis: Overview of Clustering Analysis Methods, **Partitioning Methods** - KMeans, K-Medoids. **Hierarchical methods** - BRICH. **Density-based methods-** DB-SCAN, DENCLUE. **Grid Based methods** - STING. Evolution of Cluster Analysis Overview. Outliers, Outlier Analysis.

Text Book:

1. Data Mining: Concepts and Techniques, 3rd Edition, Jiawei Han, MichelineKamber,Morgan Kaufmann Publishers

MSCCS124	Object Oriented Analysis and Design	PPW: 04
OOAD		Internal:20 External:80

UNIT - I

Process Models: Introduction, Software Development Life Cycle, Waterfall Model, V Model, Incremental Process Model, RAD Model, Iterative Model, evolutionary Process Model, Prototype Model, Spiral Model, Unified Process Model and Agile Development Model.

Introduction to UML: Importance of modelling, principles of modelling, object-oriented modelling, conceptual model of the UML, Architecture.

UNIT - II

Basic Structural Modelling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

Class & Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams.

UNIT - III

Basic Behavioural Modelling-I: Interactions, Interaction diagrams.

Basic Behavioural Modelling-II: Use cases, Use case Diagrams, Activity Diagrams

UNIT - IV

Advanced Behavioural Modelling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

Architectural Modelling: Component, Deployment, Component diagrams and Deployment diagrams.

TEXT BOOKS:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modelling Language User Guide, Pearson Education 2nd Edition.
2. Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.

MSCCS125	Web Application Development with PHP Lab	PPW: 04
WADPL		External:75

All the concepts discussed as a part of the course should be implemented using PHP.

Note:

1. All the concepts of syllabus and exercises from Text Book must be translated into programs which must be practiced, executed and written down in the practical record book.
2. In the external lab examination, the student must compile and execute at least two programs.
3. External Viva-voce is compulsory.

MSCCS126	Data Mining Lab	PPW: 04
DML		External:75

All the mining concepts discussed as a part of the course should be implemented using a mining package like WEKA or packages of Programming Languages like Python.

Note:

4. All the concepts of syllabus and exercises from Text Book must be translated into programs which must be practiced, executed and written down in the practical record book.
5. In the external lab examination, the student has to compile and execute at least two programs.
6. External Viva-voce is compulsory.

MSCCS127	Object Oriented Analysis and Design Lab	PPW: 04
OOADL		External:75

1. To develop a problem statement
2. To develop IEEE standard SRS document.
3. To identify Use Cases and develop Use Case model.
4. To identify Classes and develop Class diagram.
5. To develop Activity diagram.
6. To develop State chart diagram.
7. To develop Component diagram.
8. To develop Deployment diagram.

Above tasks are to be implemented for following applications

Case Study 1: ATM System

Case Study 2: Library Information System

Case Study 3: Online Course reservation System

Case Study 4: E-Trading

Case Study 5: E-Ticketing

9. Forward Engineer Class diagrams for the following.
 - (a) Generalization Relationship Example
 - (b) Interface Example
10. Reverse Engineer
 - (a) Aggregation Relationship Example
 - (b) Generalization Relationship Example
 - (c) Interface Example.

Note:

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2. In the external lab examination, the student must compile and execute at least two programs.
3. External Viva-voce is compulsory.

MSCCS128	Seminar	PPW: - -
SEM		External:25

- This course is meant to give students practice of speaking in front of an audience and to explore topics of their own choosing in detail.
- Students must search topics and organize presentations for faculty and other students. The topics may be any aspect of the Computer science and must be approved by the instructor in advance.
- To improve students speaking skills, each student must receive feedback from the fellow students and the instructor.

Expectations:

- Attendance at each seminar is mandatory for all the students enrolled.
- In addition, students are expected to attend all other seminars in the department, such as invited guest speakers. It is expected that students will actively participate through an interaction with the speaker.
- The effort put-in by the students to meet these expectations will be considered in the determination of the final grade.

M.Sc. (CS) II Year I Semester

Paper Code	Paper title	PPW	MARKS			Credits
			Internal	External	Total	
MSCCS211	Automata Theory and Formal Languages	04	20	80	100	04
MSCCS212	Web Technologies	04	20	80	100	04
MSCCS213 Elective - 1	C. Mobile Application Development d. Cloud Computing	04	20	80	100	04
MSCCS214 Elective - 2	C. Cryptography and Network Security d. Programming with R	04	20	80	100	04
MSCCS215	Web Technologies Lab	04	00	75	75	03
MSCCS216 Elective - 1 Lab	Mobile Application Development Lab / Cloud Computing Lab	04	00	75	75	03
MSCCS217 Elective - 2 Lab	Cryptography and Network Security Lab / Programming with R	04	00	75	75	03
MSCCS218	Seminar	--	--	25	25	01
Total Marks					650	26

MSCCS211	Automata Theory and Formal Languages	PPW: 04
ATFL		Internal:20 External:80

UNIT-I

Finite Automata and formal languages: Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, **Finite Automata:** Applications, Deterministic finite automata, (DFA), Non deterministic finite automaton (NFA), Equivalence of Deterministic and Nondeterministic Finite Automata, transition diagrams and Language recognizers, Finite Automata with Epsilon Transitions and eliminations, Finite automata with output (Moore and Mealy machines) and Inter conversion.

UNIT-II

Regular Expressions: Regular sets, regular expressions, pumping lemma and closure properties of regular sets. Identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions.

Regular Grammars: definition, right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar(CFG) - derivation trees, Right most and left most derivation of strings, ambiguity, Normal forms for CFG, Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages, Enumeration of properties of CFL.

UNIT-III

Pushdown Automata (PDA): Definition, Model, transition in PDA, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA. **Turing Machines (TM):** definition of Turing machine, model of TM, design of TM, language acceptance and Moves in a TM, difference between PDA and TM, Types of TMs.

UNIT-IV

Computability Theory: Chomsky hierarchy, decidability of problems - Properties of recursive and recursively enumerable languages, linear bounded automata, Universal Turing Machine, Un-Decidability, undecidability in Post's Correspondence problem, Definition of P and NP problems, NP complete, NP-hard problems.

Text Books:

1. Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson Education.
2. Introduction to Theory of Computation -Sipser 2nd edition Thomson.

MSCCS212	Web Technologies	PPW: 04
WT		Internal:20 External:80

UNIT-I

HTML Common tags: List, Tables, images, forms, frames, Basics of CSS and types of CSS. **Client-Side Programming** (Java Script): Introduction to Java Script, prompt dialog box, operators, Control Structures, functions, Event handlers (onclick, onsubmit, etc.). **Introduction to XML:** XML basics, structuring data, Document type definition, XML name spaces, Document Object Model (DOM).

UNIT-II

Introducing JDBC, JDBC drivers, features of JDBC, JDBC APIs, major classes and Interfaces, JDBC processes with the java.sql package, processes with the javax.sql package, working with transactions.

UNIT-III

Web applications: exploring the HTTP protocol, web architecture models, the MVC architecture. **Working with Servlets:** the features of servlets, exploring servlet API, the servlet life cycle, creating a servlet, the HttpServletRequest and HttpServletResponse interfaces, request delegation and request scope. **Handling sessions:** introducing session tracking mechanism, the java servlet API for session tracking

UNIT-IV

Introducing JSP, advantages, the architecture, life cycle of JSP, JSP basic tags and implicit objects, action tags. **Implementing Filters:** working with filters, filter API configuring filters, initializing parameter in filter.

Text Books:

1. Internet & World Wide Web How To Program By P.J. Deitel, H.M. Deitel, 4th Edition, Person Publication.
2. Java Server Programming (J2EE1.7) black book by DT Editorial Services, DreamTech Press.

MSCCS213 Elective-1(a)	Mobile Application Development	PPW: 04
MAD		Internal:20 External:80

UNIT-I

J2ME Overview Java 2 Micro Edition and the World of Java, Inside J2ME, J2ME and Wireless Devices, Small Computing Technology: Wireless Technology, Radio Data Networks, Microwave, Technology, Mobile Radio Networks, Messaging, Personal Digital Assistants

UNIT-II

J2ME Architecture and Development Environment: J2ME Architecture, Small Computing Device Requirements, Run-Time Environment, MIDlet Programming, Java Language for J2ME, J2ME Software Development Kits, Hello World J2ME Style, Multiple MIDlets in a MIDlet Suite, J2ME Wireless Toolkit. **J2ME Best Practices and Patterns:** The Reality of Working in a J2ME World, Best Practices

UNIT-III

Commands, Items, and Event Processing, **J2ME User Interfaces:** Display Class, The Palm OS. Emulator, Command Class, Item Class, Exception Handling. **High-Level Display:** Screens: Screen. Class, Alert Class, Form Class, Item Class, List Class, Text Box Class, Ticker Class **Low-Level. Display:** Canvas: The Canvas, User Interactions, Graphics, Clipping Regions, Animation.

UNIT-IV

Record Management System: Record Storage, Writing and Reading Records, Record Enumeration, Sorting Records, Searching Records, Record Listener. **JDBC Objects:** The Concept of JDBC, JDBC Driver Types, JDBC Packages, Overview of the JDBC Process, Database Connection, statement Objects, Result set, Transaction Processing, Metadata, Data Types, Exceptions. **JDBC and Embedded SQL:** Model Programs, Tables, Indexing, Inserting Data into Tables, Selecting Data from a Table, Metadata, Updating Tables, Deleting Data form a Table, Joining Tables, Calculating Data, Grouping and Ordering Data, Sub queries, VIEWS.

TEXT BOOKS:

1. J2ME: The Complete Reference, James Keogh, Tata Mc Graw Hill.

MSCCS213 Elective-1(b)	Cloud Computing	PPW: 04
CC		Internal:20 External:80

UNIT - I

Introduction: Essentials, Benefits and need for Cloud Computing - Business and IT Perspective - Cloud Services Requirements - Cloud and Virtualization - Cloud and Dynamic Infrastructure NIST model - Cloud Computing Characteristics Cloud Adoption. **Cloud Models:** Cloud deployment Models, Characteristics - Security in a Public Cloud Public versus Private Clouds, cloud as a service: cloud service models, Gamut of Cloud Solutions - Principal Technologies - Cloud Strategy Cloud Design and Implementation using SOA - Service Level Agreements SLA- Conceptual Cloud Model.

UNIT - II

Cloud Offers Management and Solutions: Cloud Ecosystem - Cloud Business Process Management - Cloud Service Management - Cloud Stack - Computing on Demand (CoD) - Cloud is sourcing. Cloud Offerings: Information Storage, Retrieval, Archive and Protection - Cloud Analytics, Testing under Cloud - Information Security - Storage Cloud. Cloud Management: Resiliency - Provisioning - Asset Management - Cloud Governance - High Availability and Disaster Recovery - Charging Models, Usage Reporting, Billing and Metering.

UNIT - III

Cloud Virtualization Technology: Virtualization Defined - Virtualization Benefits - Cloud Server Virtualization - Virtualization for x86 Architecture - Hypervisor Management Software - Logical Partitioning (LPAR)- VIO Server - Virtual Infrastructure Requirements. **Cloud Virtualization:** Storage virtualization - Storage Area Networks - Virtualized Data Center.

UNIT-IV

Cloud Service Providers: EMC, EMC IT, Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue, service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit.

Text Books:

1. Cloud Computing - Insight into New Era Infrastructure, Dr. Kumar Saurabh, Wiley India.
2. Essentials of Cloud Computing: K. Chandrasekhran, CRC press, 2014.

MSCCS214 Elective-2(a)	Cryptography and Network Security	PPW: 04
CNS		Internal:20 External:80

UNIT-I

Introduction: Attacks, security Services, Mechanisms, A Model for Network Security. Introduction to Number Theory: Divisibility and the Division Algorithm, the Euclidean Algorithm, Modular Arithmetic, Fermat's and Euler's Theorem, the Chinese Remainder Theorem, Discrete Logarithms. **Symmetric Cipher:** Classical Encryption Techniques, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography.

UNIT-II

Block Cipher and the Data Encryption: Block Cipher Principles, the Data Encryption Standard, Multiple Encryption and Triple DES, Stream Cipher-RC4, Block Cipher Modes of Operation, Advanced Encryption Standard. **Asymmetric Cipher:** Principles of Public-Key Cryptosystems, the RSA Algorithm, Diffie-Hellman Key Exchange, Elgamal cryptographic system, Elliptic Curve Cryptography, Traffic Confidentiality: link encryption, end to end encryption.

UNIT-III

Cryptographic Data Integrity Algorithms and Message Authentication: Message Authentication. Requirements, Message Authentication Function, Message Authentication Codes, Hash Functions, simple Hash functions, Hash function properties, Secure Hash Algorithm, SHA-512, HMAC. **Digital Signatures:** Properties, Attacks and forgeries, Digital signature Requirements, Kerberos.

UNIT-IV

Electronic Mail Security: Email Components, email format, Email Threats and security, S/MIME. **IP Security:** IP Security Overview, IP Security Architecture, Encapsulating Security Payload. **Web and System Security:** malicious software, Intruders, Viruses, firewalls, Secure Electronic Transaction, HTTPS.

TEXT BOOKS:

1. Cryptography and Network Security principles and Practice 7th Edition
By William Stallings (Pearson Asia)

MSCCS214 Elective-2(b)	Programming with R	PPW: 04
RPRG		Internal:20 External:80

UNIT-I

Introduction- What Is R?, Installing R, Choosing an IDE, Your First Program, Installing Extra Related Software, Scientific Calculator- Mathematical Operations and Vectors, Assigning Variables, Special Numbers, Logical Vectors; Inspecting Variables- Classes, Different Types of Numbers, Other Common Classes, Checking and Changing Classes, Examining Variables, Workspace.

UNIT-II

Vectors, Matrices, and Arrays; Lists and Data Frames-Lists, NULL, Pair lists, Data Frames; Environments and Functions

UNIT-III

Strings and Factors, Flow Control and Loops, Advanced Looping; Packages- Loading, Packages, Installing Packages, Maintaining Packages; Dates and Times- Date and Time. Classes, Conversion to and from Strings, Time Zones, Arithmetic with Dates and Times, Lubridate.

UNIT-IV

Getting Data-Built-in Datasets, Reading Text Files, Reading Binary Files, Web Data, Accessing Databases; Cleaning and Transforming- Cleaning Strings, Manipulating Data Frames, Sorting, Functional Programming; Exploring and Visualizing- Summary Statistics, Three Plotting Systems, Scatter plots, Line Plots, Histograms, Box Plots, Bar Charts, Other Plotting Packages and Systems.

Text Books:

1. Richard cotton "A step-by-step function guide to data analysis: Learning R" First edition, O'REILLY, 2013

MSCCS215	Web Technologies Lab	PPW: 04
WTL		External:75

Note:

1. All the concepts of syllabus and exercises from Text Book must be translated into programs which must be practiced, executed and written down in the practical record book.
2. In the external lab examination, the student must compile and execute at least two programs.
3. External Viva-voce is compulsory.

MSCCS216 Elective-1(a)	Mobile Application Development Lab	PPW: 04
MADL		External:75

1. Write a program to implement and display a greeting message on MIDlet.
2. Write a program to design and implement Multiple MIDlets on MIDlet.
3. Write a program to implement MIDlet Life Cycle Contraction operations.
4. Write a program to design and implement MENU creation using Command<class> on Mobile Information Device Profile.
5. Write a program to implement LogIn<Form> on MIDlet.
6. Write a program to design and implement Phone Book MIDlet.
7. Write a program to design and implement CheckBoxMIDlet.
8. Write a program to display the current date and time.
9. Write a program to display the Calendar of current month.
10. Write a program to design and implement different types of Alert Messages.
11. Write a program to design and implement List of Radio Buttons.
12. Write a program to design and implement Ticker<class> on MIDlet.
13. Write a program to design and implement non-interactive for Mobile Signal status using Gauge<class>.
14. Write a program to design and implement Draw Arc on MIDlet.
15. Write a program to design and implement KeyCode actions on MIDlet.
16. Write a program to design and implement interactive Mobile Volume Bar using Gauge<class>.
17. Write a program to design and implement Clipping Region on MIDlet.
18. Write a program to design and implement Image Slide show on MIDlet.
19. Write a program to design and implement which examine the Phone Number should be 6 - 8 numbers in telephone number with (+area code: 040, 041, 050, 0400, 044) on MIDlet.
20. Write a program to design and implement Sample Quiz for user on MIDlet.
21. Write a program to design and implement the Draw Bar Graph on MIDlet by passing the input values.
22. Write a program to design and implement the RMS Listener.
23. Write a program to design and implement the RMS Sorting
24. Write a program to design and implement the RSM Search.
25. Write a program to design and implement Login process with help of Users (uname, password) table in login database in MySQL.

Note:

1. All the programs that are practiced and executed must be written down in the practical record book.
 2. In the external lab examination, the student must compile and execute at least two programs.
1. External Viva-voce is compulsory.

MSCCS216 Elective-1(b)	Cloud Computing Lab	PPW: 04
CCL		External:75

1. Installation and configuration of Virtual Machine using VMware.
2. Study and Implementation of Infrastructure as a Service.
3. Installation and Configuration using Microsoft Azure Virtual Machine.
4. Install Google App Engine. Create hello world app and other simple web applications using Python/Java.
5. Create an Amazon EC2 Instance and Set up a Web Server on the Instance and Associate IP Address with the Instance.
6. Create a Database Instance in the Cloud using RDS.
7. Create a Database Instance in the Cloud using Google Cloud SQL.
8. Register with AWS and Create Windows/Linux Instance.
9. Create a S3 Storage Bucket and Store documents in Bucket.
10. Create a Static Web Hosting on S3 with name Kakatiya University.
11. Build a Serverless Web Application on AWS Cloud to GET KU employee details with email id only.
12. Build a Serverless Web Application on AWS Cloud to POST KU employee details with email id only.

Note:

1. All the programs that are practiced and executed must be written down in the practical record book.
2. In the external lab examination, the student must compile and execute at least two programs.
3. External Viva-voce is compulsory.

MSCCS217 Elective-2(a)	Cryptography and Network Security Lab	PPW: 04
CNSL		External:75

1. Write a 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 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 program to perform encryption and decryption using Caesar Cipher algorithm.
4. Write a program to perform encryption and decryption using Substitution cipher algorithm.
5. Write a program to perform encryption and decryption using Hill Cipher algorithm.
6. Write a program to implement the DES algorithm logic.
7. Write a program to implement RSA Algorithm.
8. Write a Program to Implement DES-2.
9. Write a program to implement Diffie-Hellman Key Exchange mechanism.
10. Write a program to encrypt user"s passwords before they are stored in a database table, and to retrieve them whenever they are to be brought back for verification.
11. Write a program on Key generation (public and private key pair).
12. Write a program to perform a digital signature on a given text.
13. Write a program to implement Random Number Generation Algorithm.
14. Write a program to implement MAC generation algorithm.
15. Write a program to implement MAC with hash.
16. Write a program to implement MAC with single key.
17. Write a program to implement MAC with double key.

Note:

1. All the programs that are practiced and executed must be written down in the practical record book.
2. In the external lab examination, the student must compile and execute at least two programs.
3. External Viva-voce is compulsory.

MSCCS217 Elective-2(b)	Programming with R Lab	PPW: 04
PWRL		External:75

Note:

1. All the concepts of syllabus and exercises from Text Book must be translated into programs which must be practiced, executed and written down in the practical record book.
2. In the external lab examination, the student has to compile and execute at least two programs.
3. External Viva-voce is compulsory.

MSCCS218	Seminar	PPW: - -
SEM		External:25

- This course is meant to give students practice of speaking in front of an audience and to explore topics of their own choosing in detail.
- Students must search topics and organize presentations for faculty and other students. The topics may be any aspect of the Computer science and must be approved by the instructor in advance.
- To improve students speaking skills, each student has to receive feedback from the fellow students and the instructor.

Expectations:

- Attendance at each seminar is mandatory for all students enrolled.
- In addition, students are expected to attend all other seminars in the department, such as invited guest speakers. It is expected that students will actively participate through an interaction with the speaker.
- The effort put-in by the students to meet these expectations will be considered in the determination of the final grade.

M.Sc. (CS) II Year II Semester

Paper Code	Paper title	PPW	MARKS			Credits
			Internal	External	Total	
MSCCS221	Artificial Intelligence	04	20	80	100	04
MSCCS222 Elective - 3	C. Machine Learning d. Big Data Analytics	04	20	80	100	04
MSCCS223 Elective - 4	C. Mobile Computing d. Information Retrieval Systems	04	20	80	100	04
MSCCS224	Major Project	--	75	175	250	10
MSCCS225	Comprehensive Viva	--	--	75	75	03
MSCCS226	Seminar	--	--	25	25	01
Total Marks					650	26

MSCCS221	Artificial Intelligence	PPW: 04
AI		Internal:20 External:80

UNIT-I

Concepts in AI, problem solving in AI, Defining an AI Problem as state space search, production systems, AI problem characteristics. Search techniques: Breadth first search, depth first search.

UNIT-II

Heuristic Search Techniques: Generate and test, hill climbing, best first search, Heuristic function applications, problem Reduction, simulated annealing. **Knowledge Representation in AI:** knowledge representations approaches & issues in knowledge representation, Knowledge Representation using predicate logic, forward and backward reasoning, semantic nets, frames, scripts & conceptual Dependency.

UNIT-III

Game Playing: The Minimax Search procedure, Adding Alpha-Beta Cutoffs, Additional Refinements, Iterative Deepening. **Expert systems:** Architecture, the knowledge base, inference engine, Knowledge acquisition Expert system development process MYCIN as an example. Types of Expert Systems - Rule Based, Case Based, Model Based **Reasoning in Uncertain Situations:** Introduction to Non monotonic Reasoning, Logic-Based Abductive Inference

UNIT-IV

Uncertainty Measures: Stochastic Approach to Uncertainty, Bayesian Belief Networks, Certainty Factor Theory, Dempster - Shafer Theory. **Machine Learning:** Machine learning Systems, Supervised and unsupervised learning, Inductive Learning and Deductive Learning. **Artificial Neural Networks:** Introduction, Single Layer and Multilayer Feed Forward Networks, Radial Basis Function, and Design Issues of ANN.

Text Books:

1. E. Rich and Knight, "Artificial Intelligence", 3rd Edition, 2009, TMH.
2. S. J. Russel and P. Norvig, "Artificial Intelligence: A Modern Approaches", Prentice Hall.
3. George F Luger, "Artificial Intelligence", Fourth Edition, Pearson Education Asia, ISBN No: 81-7808-491-0.

MSCCS222 Elective-3(a)	Machine Learning	PPW: 04
ML		Internal:20 External:80

UNIT-I

Introduction: Well-posed learning problems, Designing a learning system, Perspectives, and issues in machine learning. Concept learning and the general to specific ordering - Introduction, A concept learning task, Concept learning as search, Find- S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

UNIT-II

Linear Regression & Logistic Regression: Predicting numeric values: regression - Finding the best fit lines with linear regression, Locally weighted linear regression, Shrinking Coefficients, The bias / Variance tradeoff. Logistic Regression: Classification with logistic regression and the sigmoid function, Using optimization to find the best regression coefficients. **Artificial Neural Networks:** Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition.

UNIT-III

Evaluation Hypotheses: Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

Support vector machines & Dimensionality Reduction techniques: Separating data with the maximum margin, finding the maximum margin, efficient optimization with SMO algorithm, speeding up optimization with full Platt SMO, Using Kernels for more Complex data.

Dimensionality Reduction Techniques: Principal Component analysis.

UNIT-IV

Instance-Based Learning: Introduction, k - Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning. **Genetic Algorithms:** Representing Hypotheses, Genetic Operators, Fitness Function and Selection, Illustrative Example.

TEXT BOOKS:

1. Machine Learning ,Tom M. Mitchell, MGH
2. Machine Learning in Action, Peter Harington, 2012, Cengage

MSCCS222 Elective-3(b)	Big Data Analytics	PPW: 04
BDA		Internal:20 External:80

UNIT-I

Introduction: What is 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.

UNIT-II

Hadoop: Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structures.

UNIT-III

MapReduce : MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output formats.

UNIT-IV

Big Data Analysis: Hbase, data model and implementations, Hbase clients, Hbase examples, praxis. Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration, Hive, data types and file formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries

TEXT BOOKS:

1. Big Data Analytics, Introduction to Hadoop, Spark, and Machine-Learning, Rajkamal, PreetiSaxena, McGraw Hill, 2018.
2. Big Data, Big Analytics: Emerging Business intelligence and Analytic trends for Today's Business, Michael Minelli, Michelle Chambers, and AmbigaDhiraj, John Wiley & Sons,2013.

MSCCS223 Elective-4(a)	Mobile Computing	PPW: 04
MC		Internal:20 External:80

UNIT-I

Introduction: Mobile Communications, Mobile Computing - Paradigm, Promises/Novel Applications and Impediments and Architecture; Mobile and Handheld Devices, Limitations of Mobile and Handheld Devices. GSM - Mobile Services, System Architecture, Radio Interfaces, Protocols, Localization, Calling, Handover, Security, New Data Services, GPRS.

UNIT-II

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, near and far terminals), SDMA, FDMA, TDMA, CDMA, Wireless LAN/(IEEE 802.11)

Mobile Network Layer: Mobile IP, IP Packet Delivery, agent discovery, registration, tunneling and encapsulation, Route Optimization, DHCP.

UNIT-III

Mobile Transport Layer: Conventional TCP/IP Protocols, Indirect TCP, Snooping TCP, Mobile TCP, Other Transport Layer Protocols for Mobile Networks. **Database Issues data dissemination and synchronization:** Database Hoarding & Caching Techniques, Client-Server Computing & Adaptation, Transactional Models. **Data Dissemination and Synchronization:** Communications Asymmetry, Classification of Data Delivery Mechanisms, Broadcast Models, Selective Tuning and Indexing Methods.

UNIT- IV

Mobile Ad hoc Networks (MANETs): Introduction, Applications & Challenges of a MANET, Routing, Classification of Routing Algorithms, Algorithms such as DSR, AODV, DSDV, protocols and tools: WAP, Bluetooth, J2ME.

Text Books:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, second edition, 2018.
2. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002.

MSCCS223 Elective-4(b)	Information Retrieval Systems	PPW: 04
IRS		Internal:20 External:80

UNIT-I

INTRODUCTION: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses, **INFORMATION RETRIEVAL SYSTEM CAPABILITIES** - Search, Browse, Miscellaneous. **CATALOGING AND INDEXING:** Objectives, Indexing Process, Automatic Indexing, Information Extraction, Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT-II

AUTOMATIC INDEXING: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages. **DOCUMENT AND TERM CLUSTERING:** Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters. **USER SEARCH TECHNIQUES:** Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, weighted searches of Boolean systems, Searching the Internet and hypertext - **INFORMATION VISUALIZATION:** Introduction, Cognition and perception, Information visualization technologies.

UNIT-III

TEXT SEARCH ALGORITHMS: Introduction, Software text search algorithms, Hardware text search systems. **INFORMATION SYSTEM EVALUATION:** Introduction, Measures used in system evaluation, Measurement example - TREC results. **PARALLEL AND DISTRIBUTE IR** - Parallel Computing, Performance Measures, Parallel IR - MIMD and SIMD Architectures, Distributed IR - Collection Partitioning, Source Selection, Query Processing, Web Issues, Trends and Research Issues.

UNIT-IV

MULTIMEDIA INFORMATION RETRIEVAL - Models and Languages - Data Modelling, Query Languages, Indexing and Searching. **BRARIES AND BIBLIOGRAPHICAL SYSTEMS** - Online IR Systems, OPACs, Digital Libraries.

TEXT BOOKS:

1. Information Storage and Retrieval Systems: Theory and Implementation
By Kowalski, Gerald, Mark T Maybury Kluwer Academic Press, 2000.

MSCCS224	Major Project	PPW: - -
MP		Internal:75 External:175

The Project work constitutes a major component in most professional programmes. It needs to be carried out with due care and should be executed with seriousness by the students. The project work is not only a partial fulfilment of the M.Sc. Course requirements, but also provide a mechanism to demonstrate ASK (Attitude, Skills, and Knowledge) with specialisation. The project work should compulsorily include the software development. Physical installations/configuring of LAN/WAN or theoretical projects or study of the systems, which doesn't involve s/w development, ***ARE STRICTLY NOT ALLOWED.***

The students are expected to work on a real-life project preferably in some industry/ R&D Laboratories / Educational Institution / Software Company. Students are encouraged to work in their interested area. The student can formulate a project problem with the help of his / her Guide of the concerned college. **APPROVAL OF THE PROJECT PROPOSAL IS MANDATORY** by his/her Guide. If approved, the student can commence working on it, and complete it. Working with the latest versions of the software packages for the development of the project is much appreciated. Project problem domain selected and the specifications should be genuine.

MSCCS225	Comprehensive Viva	PPW: - -
CV		External:50

- The objective of conducting Comprehensive viva-voce is to test the overall understanding of the student on the various fields related to Computer Science and allied subjects.
- Most important aspect is, the student needs to be aware of the entire syllabus of M.Sc.(Computer Science) course right from the first year and is expected to be thorough with the content, recall all the units and prepare for the appropriate questions.

MSCCS226	Seminar	PPW: - -
SEM		External:25

- This course is meant to give students practice of speaking in front of an audience and to explore topics of their own choosing in detail.
- Students must search topics and organize presentations for faculty and other students. The topics may be any aspect of the Computer science and must be approved by the instructor in advance.
- To improve students speaking skills, each student must receive feedback from the fellow students and the instructor.

Expectations:

- Attendance at each seminar is mandatory for all students enrolled.
- In addition, students are expected to attend all other seminars in the department, such as invited guest speakers. It is expected that students will actively participate through an interaction with the speaker.
- The effort put-in by students to meet these expectations will be considered in the determination of the final grade.