OFFICE OF THE REGISTRAR
KAKATIYA UNIVERSITY
WARANGAL – 506 009

No.1004/B3/KU/2025 Date: 23 /07/2025

To
The Members of
Board of Studies in Computer Science (U.G. & P.G)
KAKATIYA UNIVERSITY

Sub: **MEETINGS** – Meeting of the BOS in Computer Science (P.G.) on 24/07/2025 at 2:00 pm. – Intimation – Sent

Ref: Letter No. 994/CS/UC/KU/2025 dated. 19/07/2025 of the Chairperson, Board of Studies in Computer Science KU.

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Sir/Madam,

I am to inform you that the Board of Studies in Computer Science (P.G.) will meet on 24/07/2025 at 2:00 pm. in the office of the Head, Department of Computer Science Kakatiya University to discuss the following agenda:

Agenda:

1. M.C.A. course Syllabus approval for the academic year 2025-26 onwards.
2. Any other mater with the permission of Chair

The External Members shall be paid TA and DA, as per rules from the provision of "University Fund Account" for the academic year 2025-2026. The out-station members shall be paid TA & DA as per norms from the provision of "20% Registration Fee" kept at the disposal of the respective Colleges for academic activities.

Kindly make it convenient to attend the meeting without fail.

Yours faithfully,

REGISTRAR

Copy to:

1) The Principal, University College, KU
2) The Head Department of Computer Science, KU
3) The Finance Officer, KU
4) The Audit Officer/Asst. Registrar (Audit/Accounts),KU
5) The Secretary to Vice-Chancellor, KU.
6) The P.A. to Registrar, KU.
7) The SF.

KAKATIYA UNIVERSITY, WARANGAL
DEPARTMENT OF COMPUTER SCIENCE
MCA COURSE STRUCTURE UNDER CBCS
WITH EFFECT FROM 2025-26

MCA I YEAR I SEMESTER

Paper No	Paper Title / Subject	Workload Per Week (Theory/Lab)	MARKS			Credits
			Internal	External	Total	
MCA111	Data Structures with C	T (4)	20	80	100	4
MCA112	Java Programming	T (4)	20	80	100	4
MCA113	Advanced Database Management System	T (4)	20	80	100	4
MCA114	Operating System	T (4)	20	80	100	4
MCA115	Probability and Statistical Methods	T (4)	20	80	100	4
MCA116	Data Structures with C Laboratory	L (4)	--	50	50	2
MCA117	Java Programming Laboratory	L (4)	--	50	50	2
MCA118	Advanced Database Management System Laboratory	L (4)	--	50	50	2
MCA119	Seminar	--	25	--	25	1
Grand Total (Marks and Credits)					675	27

KAKATIYA UNIVERSITY, WARANGAL
DEPARTMENT OF COMPUTER SCIENCE
MCA COURSE STRUCTURE UNDER CBCS
WITH EFFECT FROM 2025-26

MCA I YEAR II SEMESTER

Paper No	Paper Title / Subject	Workload Per Week (Theory/Lab)	MARKS			Credits
			Internal	External	Total	
MCA121	Python Programming	T (4)	20	80	100	4
MCA122	Data Mining	T (4)	20	80	100	4
MCA123	Web Technologies	T (4)	20	80	100	4
MCA124	Computer Networks	T (4)	20	80	100	4
MCA125	Principles and Practice of Management	T (4)	20	80	100	4
MCA126	Python Programming Laboratory	L (4)	--	50	50	2
MCA127	Data Mining Laboratory	L (4)	--	50	50	2
MCA128	Web Technologies Laboratory	L (4)	--	50	50	2
MCA129	Seminar	--	25	--	25	1
Grand Total (Marks and Credits)					675	27

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MCA II YEAR I SEMESTER

Paper No	Paper Title / Subject	Workload Per Week (Theory/Lab)	MARKS			Credits
			Internal	External	Total	
MCA211	Digital Image Processing	T (4)	20	80	100	4
MCA212	Cryptography and Network Security	T (4)	20	80	100	4
MCA213	Machine Learning	T (4)	20	80	100	4
MCA214	Theory of Computation	T (4)	20	80	100	4
MCA215	Elective – I	T (4)	20	80	100	4
MCA216	Digital Image Processing Laboratory	L (4)	--	50	50	2
MCA217	Cryptography and Network Security Laboratory	L (4)	--	50	50	2
MCA218	Machine Learning Laboratory	L (4)	--	50	50	2
MCA219	Seminar	--	25	--	25	1
Grand Total (Marks and Credits)					675	27

Elective – I

a. Design and Analysis of Algorithms
b. Cloud Computing
c. Mobile Computing

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MCA II YEAR II SEMESTER

Paper No	Paper Title / Subject	Workload Per Week (Theory / Lab)	MARKS			Credits
			Internal	External	Total	
MCA221	Artificial Intelligence	T (4)	20	80	100	4
MCA222	Elective-II	T (4)	20	80	100	4
MCA223	Elective-III	T (4)	20	80	100	4
MCA224	Project	L (12)	--	200	200	8
MCA225	Comprehensive Viva	--	--	50	50	2
MCA226	Seminar	--	25	--	25	1
Grand Total (Marks and Credits)					575	23

Elective – II

a. Software Engineering.
b. Software Project Management
c. Object Oriented Analysis and Design with UML

Elective – III

a. Natural Language Processing.
b. Deep Learning
c. Text Data Analytics.

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MCA I YEAR I SEMESTER

Paper No	Paper Title / Subject	Workload Per Week (Theory/Lab)	MARKS			Credits
			Internal	External	Total	
MCA111	Data Structures with C	T (4)	20	80	100	4
MCA112	Java Programming	T (4)	20	80	100	4
MCA113	Advanced Database Management System	T (4)	20	80	100	4
MCA114	Operating System	T (4)	20	80	100	4
MCA115	Probability and Statistical Methods	T (4)	20	80	100	4
MCA116	Data Structures with C Laboratory	L (4)	--	50	50	2
MCA117	Java Programming Laboratory	L (4)	--	50	50	2
MCA118	Advanced Database Management System Laboratory	L (4)	--	50	50	2
MCA119	Seminar	--	25	--	25	1
Grand Total (Marks and Credits)					675	27

MCA111	Data Structures with C		DSC
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I

Introduction to C: Introduction, data types, variables and constants, operators and expressions, control statements, functions, pointers**. Arrays**: introduction, declaration of array, accessing the elements of an array, array operation, two-dimension arrays, multi-dimensional arrays. **Introduction to data structures**: Abstract Data Types, time and space complexity, Big O notation, Omega Notation, theta Notation. **Structures and Unions**: introduction, nested structures, unions.

UNIT-II

Sorting & Searching: Introduction to searching, Linear search, binary search, introduction to sorting, bubble sort, insertion sort, selection, merge sort, quick sort. **Linked lists**: introduction, singly Linked Lists, circular Linked lists, doubly linked lists, circular doubly linked lists, header linked lists, multi-linked lists. **Stack**: introduction, array representation, operations, linked representation, multiple stacks.

UNIT-III

Queues: Introduction, array representation, linked representation types of queues. **Trees**: Introduction, types of Trees, creating a Binary Tree from general tree, traversing a binary tree, Huffman's tree. **Binary trees**: Binary Search Tree, operations on binary search tree, threaded binary trees, AVL tree, red-black trees, splay trees.

UNIT-IV

Multi-way search trees: introduction, B-Trees, B+ trees.**Heaps**: binary Heaps, Binomial Heap, Fibonacci heaps.**Graphs:** introduction, terminology, directed graphs, Bi-connected components, representation of graphs, graph traversal algorithms, topological sorting, shortest path algorithms. **Hashing**: hash table, Hash Functions, Collisions.

Text Books:

1. Reema Thareja, Data Structures using C, 2nd Edition, Oxford publication.
2. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Cengage Learning.
3. Seymour Lipchutz (1986), Theory and Problems of Data Structures, Tata Mc Grew.

MCA112	Java Programming		JP
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I

An overview of Java- Object oriented Programming, a first simple program. **Introducing classes**- fundamentals, declaring objects, object reference variables, methods, constructors, this keyword, garbage collection, overloading methods, object as parameters, returning objects, introducing access control, understanding static, introducing final, nested and inner classes, using command-line arguments, varargs. **Inheritance**- inheritance basics, using super, multilevel hierarchy, method overriding, dynamic method dispatch, abstract classes, using final with inheritance. (ch - 6, 7, 8)

UNIT-II

Packages and Interfaces- packages, packages and member access, importing packages, interfaces, default interface methods, static methods in an interface, private interface methods. **Exception**- exception handling fundamentals, exception types, uncaught exception, try and catch, multiple catch clause, nested try, throw, throws, finally, built-in exception, creating user exception, chained exception. **Multithreading programming**- java thread model, main thread, creating a thread, multiple threads, thread priorities, isAlive() and join(), synchronization, interthread communication (ch- 9, 10, 11)

UNIT-III

Enumerations, type wrappers, autoboxing, annotations. **Generics**- what are generics, generic class with two type parameters, bounded types, wildcard arguments, generic method, generic interface, class hierarchies. **String handling**- string constructors, string length, special string operators, Character extraction, string comparison, searching and modifying, StringBuffer, StringBuilder, File, steam classes, Byte Streams, Character Streams, console class, serialization (ch-12, 18, 19)

UNIT-IV

Introducing swings- origins, features, the MVC connection, components and Containers, JLabel, JTextField, swing buttons, JTabbedPane, JList, JComboBox, Trees, JTable, JMenuBar, JMenu, JMenuItem, create Main Menu, JRadioButtonMenuItem, CheckBoxMenuItem, Popup Menu, ToolBar, using action. **Event Handling**- event handling mechanisms, delegation event model, event classes, KeyEvent Class, source of events, event Listener Interface, delegation event model. (Ch-25, 33, 34)

Textbooks / References:

1. Herbert Schildt, Java: The Complete Reference, 12th Edition, McGraw-Hill Education, 2024
2. Goetz, Brian. Java concurrency in practice. Pearson Education, 2006.
3. Kathy Sierra, Bert Bates & Trisha Gee, Head First Java: A Brain-Friendly Guide, 3Edition, O'Reilly. 2022
4. Barbara Liskov& John Guttag, Program Development in Java: Abstraction, Specification and Object-Oriented Design, Addison-Wesley, 2000.

MCA113	Advanced Database Management System		ADMS
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I

The Relational Data Model and Relational Database Constraints- Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, update operations, Transactions and dealing with constraint violation. **The Relational Algebra and Relational Calculus**- Unary Relational Operations: SELECT and PROJECT – Relational Algebra Operations from Set Theory – Binary Relational Operations: JOIN and DIVISION – Additional Relational Operation – The Tuple Relational Calculus – The Domain Relational Calculus.

UNIT-II

Functional Dependencies and Normalization for Relational Databases- Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form. **Relational Database Design Algorithms and Further Dependencies**- Properties of Relational Decompositions, multi-valued dependencies and fourth normal form, Join Dependencies and Fifth Normal Form.

UNIT-III

Introduction to Transaction Processing Concepts and Theory- Introduction to Transaction Processing, Transaction and System Concept, Desirable Properties of Transactions, characterizing Schedules Based on Recoverability, characterizing schedules Based on Serializability. **Concurrency Control Techniques**- Two-Phase Locking Techniques for Concurrency Control, Concurrency Control Based on Timestamp Ordering. **Database Recovery Techniques**- Recovery Concepts, Recovery Techniques Based on Deferred Update, Recovery Techniques Based on Immediate Update, Shadow paging.

UNIT-IV

Database Security- Introduction to Database Security Issues, Discretionary Access Control Based on Granting and Revoking Privileges, Mandatory Control and Role-based control for multilevel security, challenges to Database Security. **Distributed Databases and client**-Server Architecture- Distributed Database Concepts, Data Fragmentation, replication, and allocation techniques for distributed database design, types of Distributed database system, query processing in Distributed Databases, overview of concurrency control and recovery in distributed databases, overview of 3-tier client-server architecture, Distributed databases in oracle.

Text Book:

Fundamentals of Database Systems by – Ramez Elmasri, Shamkant B. Navathe 6Edition

Reference Book:

Database System Concepts (4 Edition) by - Silber Schatz, Korth G. Sudarshan (TMH)

MCA114	Operating System		OS
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT -I

Introduction: Operating System Structure- Layered structure, system components, operating system functions, Classification of Operating Systems- Batch, Time-sharing, Real-Time Systems, Multiuser 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 fromdeadlock.

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 9Ed, John Wiley
2. Advanced programming in the UNIX environment, W.R.Stevens, Pearson Education.

Reference Books:

1. SibsankarHalder and Alex A Arvind, "Operating Systems", Pearson Education.
2. Harvey M Dietel, "An Introduction to Operating System", Pearson Education.
3. William Stallings, "Operating Systems: Internals and Design Principles", 6th Edition, Pearson
4. Operating System A Design Approach-Crowley,TMH.
5. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
6. Unix Internals The New Frontiers, U.Vahalia, Pearson Education.

MCA115	Probability and Statistical Methods		PSM
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I

Measures: Measures of Central Tendency and Dispersion, Moments, Skewness and Kurtosis. **Probability**: Basic concepts and Basic terms of Probability, Addition, Multiplication and Baye's Theorem, Random variables, Definition of Mathematical Expectation and Moment Generating Function.

UNIT-II

Probability Distributions: Statement, Mean, Variance and Applications of Binomial, Poisson and Normal Distributions.

Correlation and Regression: Concept of Correlation, Computation of Karl-Pearson Correlation Coefficient, Spearman's Rank Correlation Coefficient, Simple Linear Regression, Regression Coefficient, Lines of Regression with Simple Applications.

UNIT-III

Testing of Statistical Hypothesis: Concepts of Population, Sample, Parameter, Statistic, Null and Alternative Hypotheses, Critical Region, Two Types of Errors, Level of Significance. Chi-Square (χ^2) Tests for Single Variance, Goodness of Fit and Independent of Two Attributes, T-Test for Single Mean, Difference of Two Sample Means (Independent and Paired Samples) F-Test for Difference of Two Independent Sample Variances.

UNIT-IV

Analysis of Variance: Analysis of Variance One Way and Two Way Classified Data with One Observation Per Cell.

Text Books:

1. Fundamental of Mathematical Statistics-S.C.Gupta and V.K.Kapoor
2. Fundamentals of Applied Statistics -S.C.Gupta and V.K.Kapoor

Reference Books:

1. Statistical Methods-S.P.Gupta.
2. Fundamental of mathematical statistics by - v k kapoor and guptasc
3. Statistics (phi) by - freud
4. Probability statistics and random process by - r veerarajan (tmh)
5. Introduction to probability & statistics by - j.s. Milton &jcarnold (tmh)
6. Miller & ferunds probability & statistics froenginner by - johnson (pearson)
7. Probability & statistics fro engineers & statisticsts by - walpose (pearson)

MCA116	Data Structures with C Laboratory	DSCL
WORK LOAD: 4 PPW	Credits : 2	EXTERNAL MARKS: 50

1. Program to print an array in reverse order
2. Program to find the largest element of an array
3. Program to find the second largest element of an array
4. Program to find the smallest element of an array.
5. Create Linked List and find size and search an item.
6. Write a program to Update, remove an Item in Linked List
7. Split Linked List into two
8. Using structures to accept & display employee details & calculate total payments of workers.
9. Write a program to implement stack using linked list.
10. Write a program to convert infix into postfix expression.
11. Write a program Evaluate postfix expression.
12. Write a program to Push, pop & display stack elements
13. Write a program to find a word using binary search
14. Create a binary search tree
15. Search a number using binary search and linear search
16. Sort data using Quick Sort and Selection Sort
17. Sort numbers using bubble sort and quick sort
18. Sort elements using selection sort and insertion sort
19. Sort elements using heap sort and radix sort
20. Write a Program to Calculate Size of a Tree | Recursion
21. Find the Node with Minimum Value in a Binary Search Tree
22. Program to Determine if Given Two Trees are Identical or Not
23. Find the Maximum Depth or Height of Given Binary Tree
24. Print Nodes at K Distance from Root
25. Program to Count Leaf Nodes in a Binary Tree
26. Convert a Binary Tree into its Mirror Tree
27. Given a Binary Tree, Print Out All of its Root-to-leaf Paths One per Line.
28. Lowest Common Ancestor in a Binary Search Tree.
29. Check for Children Sum Property in a Binary Tree
30. Write a c program to implement Tree Traversals: in-order, pre-order and post-order.
31. Write a c program to implement basic operation on binary tree: insertion, deletion, search and traversing.

NOTE:

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

MCA117	Java Programming Laboratory	JPL
WORK LOAD: 4 PPW	Credits : 2	EXTERNAL MARKS: 50

1. Java program using static variable and method
2. Java program using interface
3. Java program to print sum of command line arguments
4. Java program using constructor
5. Java program to take command line arguments
6. Java program to use class and objects
7. Java program using conditional operators
8. Java program to use this keyword
9. Java program to use super keyword
10. Java program for method overloading
11. Java program using abstract class
12. Program with try and catch & finally block.
13. Program for multiple catch with single try
14. Program illustrating throws keyword.
15. Program for chained exception.
16. Program to implement thread using runnable interface
17. Program to creating multiple thread
18. Program for producer consumer problem
19. Program to set priorities of thread.
20. Java program to implement single inheritance
21. Java program to implement multi-level inheritance
22. Java program to implement hierarchical inheritance
23. Java program to call a superclass constructor from sub/child class
24. Java program to call the method with the same name using super keyword
25. Program to create a frame with three button
26. Program to display message with radio buttons

NOTE:

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

MCA118	Advanced Database Management System Laboratory	ADMSL
WORK LOAD: 4 PPW	Credits: 2	EXTERNAL MARKS: 50

All the programs must cover on bellow topics:

DDL, DML and DCL Commands, SQL constraints, MySQL Clauses, Using Joins, Indexes, Creating Views, SQL Transactions, Aggregate Functions, Programming in PL/SQL, Procedures, Functions.

NOTE:

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

MCA119	Seminar	SEM
WORK LOAD:	Credits: 1	INTERNAL MARKS: 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.

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Paper No	Paper Title / Subject	Workload Per Week (Theory/Lab)	MARKS			Credits
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MCA121	Python Programming	T (4)	20	80	100	4
MCA122	Data Mining	T (4)	20	80	100	4
MCA123	Web Technologies	T (4)	20	80	100	4
MCA124	Computer Networks	T (4)	20	80	100	4
MCA125	Principles and Practice of Management	T (4)	20	80	100	4
MCA126	Python Programming Laboratory	L (4)	--	50	50	2
MCA127	Data Mining Laboratory	L (4)	--	50	50	2
MCA128	Web Technologies Laboratory	L (4)	--	50	50	2
MCA129	Seminar	--	25	--	25	1
Grand Total (Marks and Credits)					675	27

MCA121	PYTHON PROGRAMMING		PP
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT - I

Python Basics, Objects- Python Objects, Standard Types, Other Built-in Types, Internal Types, Standard Type Operators, Standard Type Built-in Functions, Categorizing the Standard Types, Unsupported Types. Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built in Functions, Related Modules, Sequences - Strings, Lists, and Tuples, Mapping and Set Types.

UNIT - II

Functions: what are functions, function calling, function creation and function passing, formal arguments, variable-length arguments, variable scope. Modules: Modules and Files, Namespaces, Importing Modules, features of Module import, Module Built-in Functions, Packages, Other Features of Modules. Object-oriented programming: introduction, classes, class attributes, instances, instance attributes, binding and method invocation, static methods and class methods, composition, subclassing and derivation, inheritance, built-in function for classes, instances and other objects.

UNIT – III

Files: File Objects, File Built-in Function, File Built-in Methods, File Built-in Attributes, Standard Files, Command line Arguments, File System, File Execution, Persistent Storage Modules, Related Modules. Exceptions: Exceptions in Python, Detecting and Handling Exceptions, Context Management, Exceptions as Strings, Raising Exceptions, Assertions, Standard Exceptions, Creating Exceptions, Exceptions and the sys Module. Regular Expressions: Introduction, Special Symbols and Characters, Res and Python.

UNIT - IV

Multithreaded Programming: Introduction, Threads and Processes, Python, Threads, and the Global Interpreter Lock, Thread Module, Threading Module, Related Modules. GUI Programming: Introduction, Tkinter and Python Programming, Brief Tour of Other GUIs, Related Modules and Other GUIs. Web Programming: Introduction, Web Surfing with Python, Creating Simple Web Clients, Advanced Web Clients, CGI-Helping Servers Process Client Data, Building CGI Application, Advanced CGI, Web (HTTP) Servers.

Text Book:

1. Core Python Programming, Wesley J. Chun, Second Edition, Pearson.

Reference Books:

1. Python for Programmers, Paul Deitel, Harvey Deitel, Pearson.
2. Think Python, Allen Downey, Green Tea Press
3. Introduction to Python, Kenneth A. Lambert, Cengage
4. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
5. Learning Python, Mark Lutz, O'Reilly

MCA122	DATA MINING		DM
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I:

Introduction to Data Mining: Introduction, what is Data Mining, Definition, KDD, Challenges, Data Mining Tasks, Data Pre-processing, Data Cleaning, Missing data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binarization, Data Transformation; Measures of Similarity and Dissimilarity- Basics.

UNIT-II:

Association Rules: Problem Definition, Frequent Item Set Generation, The APRIORI Principle, Support and Confidence Measures, Association Rule Generation; APRIOIRI Algorithm, The Partition Algorithms, FP-Growth Algorithms, Compact Representation of Frequent Item Set- Maximal Frequent Item Set, Closed Frequent Item Set.

UNIT-III:

Classification: Problem Definition, General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision Trees-Decision tree Construction, Methods for Expressing attribute test conditions, Measures for Selecting the Best Split, Algorithm for Decision tree Induction; Naive-Bayes Classifier, Bayesian Belief Networks; K- Nearest neighbor classification-Algorithm and Characteristics.

UNIT-IV:

Clustering: Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms, Partitioning Clustering K-Means Algorithm, K-Means Additional issues, PAM Algorithm; Hierarchical Clustering-Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering Algorithm, Specific techniques, Key Issues in Hierarchical Clustering, Strengths and Weakness; Outlier Detection.

Text Books:

1.Data Mining- Concepts and Techniques- Jiawei Han, Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Edition, 2006.
2. Introduction to Data Mining, Pang-Ning Tan, Vipin Kumar, Michael Steinbanch, Pearson Education.
3. Data mining Techniques and Applications, Hongbo Du Cengage India Publishing.

Reference Books:

1. Data Mining Techniques, Arun K Pujari, 3rd Edition, Universities Press.
2.Data Mining Principles & Applications – T.V Sveresh Kumar, B.Esware Reddy, Jagadish S Kalimani, Elsevier.
3. Data Mining, Vikaram Pudi, P Radha Krishna, Oxford University Press.

MCA123	WEB TECHNOLOGIES		WT
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 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. **Java EE overview**: Exploring enterprise architecture types, features of java EE platform, introducing web servers, introducing application servers.

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.

MCA124	COMPUTER NETWORKS		CN
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 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 De-multiplexing, 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, ErrorDetection 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)

Reference books:

1. Business Data Communication & Networks By - Fitz Gerald (John Wiley)
2. Data & Computer Communications - W Stallings (Pearson, Phi)
3.Computer Communications & Networking Topologies-Magallo,V.M.Hancock (Thomson)
4. Data Communication & Computer Networks - R. Agarwal, Bb Tiwari (Vikas)
5. Computer Networks - As Tanenbaum (Phi)
6. Computer Networks - Black (Phi)
7. Under Standing Communications & Networks - Wa Shay (Thomson)

MCA125	PRINCIPLES AND PRACTICE OF MANAGEMENT		PPM
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT – I

Management: Meaning - Nature - Significance of Management Principles of Management - Approaches to Management, Development of Management Thought, Management Process and Skills, Managers and Environment, Social Responsibilities of Management. **Planning**: Concept, Characteristics - Importance and Limitations Steps in Planning Process - Strategic Planning - Decision Making.

UNIT – II

Organising: Concept - Importance - Steps in Organizing Process Base and Problems of Depart mentation - Delegation of Authority - Centralization and Decentralization - Line and Staff Relations - Span of Management.

UNIT – III

Directing: Nature and Importance - Communication - Concept Elements - Process - Patterns of Communication Barriers to Communication**. Motivation**: Nature and Significance - Types of Motivation, Determinants of Motivation - A Brief Discussion on Theories of Motivation (MASLOW's Theory, McCLLELAND FNEED THEORY, THEORY X AND THEORY). **Leadership**: Concept - Importance - Leadership Styles - Autocratic, Democratic and Free Rein.

UNIT – IV

Staffing: Concept - Human Resource Planning - A Brief Description of Recruitment - Selection - Training and Appraisal Methods Controlling: Meaning - Importance - Steps in Control Process - Problems of Controlling - A Brief Description of Control Techniques. **Coordination**: Need for Coordination - Approaches to Effective Coordination - Techniques of Coordination.

Text Book:

1. Principles and Practice of Management by L.M. Prasad.

Reference Books

1. Management, James A.F. Stoner And Charles Wankel
2. Management, Koontz Harold AndO'donnel Cyril
3. OrganisationAnd Management, Louis Allen
4. Management - Tasks And Responsibilities, Peter F Drucker

MCA126	Python Programming Laboratory	PPL
WORK LOAD: 4 PPW	Credits : 2	EXTERNAL MARKS: 50

1. Demonstrate about Basics of Python Programming.
2. Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
3. Demonstrate the working ofid(), type() and range() functions in Python.
4. Write a Python program to demonstrate various base conversion functions.
5. write a Python program to demonstrate various type conversion functions.
6. Demonstrate all the Operators in Python with suitable examples.
7. Write Python programs to demonstrate input( ) , print( ), 'sep' attribute, 'end' attribute, replacement Operator ({ }).
8. Demonstrate all Conditional statements in Python with suitable examples.
9. Demonstrate the following Iterative statements in Python with suitable examples.
10. Demonstrate control transfer statements (break, continue and pass) in Python with suitable examples.
11. Write a Python program to demonstrate various ways of accessing the string.
12. i) By using Indexing (Both Positive and Negative) and ii) By using Slice Operator.
13. Python program to perform read and write operations on a file.
14. Python program to copy the contents of a file to another file.
15. Python program to count frequency of characters in a given file.
16. Python program to print each line of a file in reverse order.
17. Python program to compute the number of characters, words and lines in a file.
18. Demonstrate the different ways of creating list objects with suitable example programs.
19. Demonstrate the following functions/methods which operates on lists in Python with suitable examples:
20. Demonstrate list slicing and list comprehension with suitable example.
21. Demonstrate the different ways of creating tuple objects with suitable example programs.
22. Demonstrate all the functions/methods which operates on tuples in Python with suitable examples:
23. Demonstrate the different ways of creating set objects with suitable example programs.
24. Demonstrate all the functions/methods which operates on sets in Python with suitable examples:
25. i) add( ) ii) update( ) iii) copy( ) iv) pop( ) .
26. Demonstrate the different ways of creating dictionary objects with suitable example programs.
27. Demonstrate all the functions/methods which operates on dictionary in Python with suitable examples.
28. Demonstrate the following kinds of Parameters used while writing functions in Python.
29. Write a Python program to return multiple values at a time using a return statement.
30. Write a Python program to demonstrate Local and Global variables
31. Demonstrate lambda functions in Python with suitable example programs.
32. Write a python program to demonstrate a) creating thread, b) thread life cycle, c) thread priority, d) thread synchronizing.
33. Creating a GUI program using this Tkinter is simple.
34. Build a GUI application (as a window) and Add those widgets..

NOTE:

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

MCA127	Data Mining Laboratory	DML
WORK LOAD: 4 PPW	Credits : 2	EXTERNAL MARKS: 50

(Using Python, Java, WEKA or any open source data mining tool)

1. List all the categorical (or nominal) attributes and the real-valued attributes separately.
2. One type of model that you can create is a Decision Tree -train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.
3. Implement classification with a user define data set.
4. Describe what is cross -validation briefly. Train a Decision Tree again using cross validation and report your results.
5. Implement decision tree with cross validation.
6. Write a program to Generate Association rules by using Apriori algorithm
7. Write a program to implement naïve Bayesian classification
8. Write a program to implement k-means clustering algorithm
9. Write a program to implement k-mediods clustering algorithm
10. Write a program to implement dbscan algorithm.

NOTE:

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

MCA128	Web Technologies Laboratory	WTL
WORK LOAD: 4 PPW	Credits : 2	EXTERNAL MARKS: 50

1. Design a WEB page with Your Name and Address; using heading, formatting tags.
2. Design a small website KU MSc (CS) 2015 - 2016 Syllabus using tables & hyperlinks
3. Design a WEB GALLARY on FRESHERS PARTY
4. Design WEB pages demonstrate FRAMES (Horizontal/Vertical/Mixed)
5. Design a WEB PROFILE / BIODATA describing your academic/technical/personal
6. Design WEB page on your friends list; each friend is link; prepare web documents
7. Write a CSS program to 'GROUPING' for HEAD TAGS with different property values.
8. Write a CSS program to CLASS SELECTOR for FONT TAG with ALIGN (L-C-R-J).
9. Write a CSS program to INLINE STYLE for PARAGRAPH TAG.
10. Write a CSS program to MULTIPLE STYLE for HEAD TAGS with different properties
11. Write a CSS program to prepare and illustrate EXTERNAL STYLE SHEET
12. Write a java script program to demonstrate POPUP BOXES.
13. Write a JS program Add-Sub-Mul-Div operations with FORM support.
14. Write a java script program to compute BIG & SMALL Number with FORM support
15. Write a java script program rainbow colors (VIBGYOR) as BGCOLOR with Button
16. Write a java script program to demonstrate Document Object Model references:
    i. Array<object> ii. String <object> iii. Math<object> iv. Date<object>
17. Write a java script program to demonstrate EVENTS.
    i. OnChange( ) ii. OnClick( ) iii. OnSelect( ) iv. OnUnLoad( )

Write a JDBC program to create a DOCTOR (did, dname, qual, design, sal, specialist) table using TYPE-I Driver (MS-SQL/MySQL//Oracle10gXE).

18. Write a JDBC program to retrieve records from DOCTOR table it must be displayed in tabular-format using TYPE-III Driver MySQL.
19. Write a JDBC Program to alter DOCTOR (did, dname, qual, design, sal, specialist) table. to modify sal as number(10,2) ; to add a new column as hospital as varchar2 (20) not null.
20. Write a JDBC Program to demonstrate DBMD (DatabaseMetaData) you must take 10-12 important methods to get the comprehensive information about the used/chosen database in-detail. (TYPE-III Driver MySQL).
21. Write a JDBC Program to demonstrate RSMD (ResultSetMetaData) you must take 8-10 important methods to get the comprehensive information about the used/chosen table in-detail. (TYPE-IV Driver/Thin – Oracle10g XE Database).
22. Write a JDBC Program to insert records into STUDENT (rno, sname, course, fee, college, loc) at run-time using PreparedStatement.
23. Write a JDBC Program to retrieve records from FACULTY (fid, fname, designation) table by creating appropriate STORED PROCEDURE and CallableStatement.
24. Write a Servlet Program to display your complete address using GenericServlet
25. Write a Servlet Program to communicate HttpServlet
26. Write a Servlet Program to retrive the records from a faculty (fid, fname, qual, design, exp, dept) table in the tabular format.
27. Write a Servlet Program to insert records into database table EMP (empno, ename, sal) using Statement <interface>.
28. Write a Servlet Program for Session Tracking using HttpSession.
29. Write a JSP program to demonstrate ASMD Operation with support of User Interface.
30. Write a JSP program to display Current Live Time.
31. Write a JSP program to demonstrate Form Processing using get () and post () methods.
32. Write a JSP program to demonstrate Hit Count of Your Home Page.
33. Write a JSP program to insert records into **emp** (empno, ename, sal) table with appropriate UI.
34. Write a JSP program to update or modify the give record in **emp** table with appropriate UI.
35. Write a JSP program to delete the give record from **emp** table with appropriate UI.
36. Write a JSP program to display the records in tabular format for **emp** table.

NOTE:

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

MCA129	Seminar	SEM
WORK LOAD:	Credits: 1	INTERNAL MARKS: 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.

KAKATIYA UNIVERSITY, WARANGAL
DEPARTMENT OF COMPUTER SCIENCE
MCA COURSE STRUCTURE UNDER CBCS
WITH EFFECT FROM 2025-26

MCA II YEAR I SEMESTER

Paper No	Paper Title / Subject	Workload Per Week (Theory/Lab)	MARKS			Credits
			Internal	External	Total	
MCA211	Digital Image Processing	T (4)	20	80	100	4
MCA212	Cryptography and Network Security	T (4)	20	80	100	4
MCA213	Machine Learning	T (4)	20	80	100	4
MCA214	Theory of Computation	T (4)	20	80	100	4
MCA215	Elective – I	T (4)	20	80	100	4
MCA216	Digital Image Processing Laboratory	L (4)	--	50	50	2
MCA217	Cryptography and Network Security Laboratory	L (4)	--	50	50	2
MCA218	Machine Learning Laboratory	L (4)	--	50	50	2
MCA219	Seminar	--	25	--	25	1
Grand Total (Marks and Credits)					675	27

Elective – I

a. Design and Analysis of Algorithms
b. Cloud Computing
c. Mobile Computing

MCA211	DIGITAL IMAGE PROCESSING		DIP
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I

Introduction: what is Digital image processing, origins of digital image processing, Fundamental steps in digital image processing, and Components of an image processing system. **Digital Image Fundamentals**: image sensing and acquisition, Image sampling and quantization, some basic relationships between pixels, Linear and nonlinear operation, image transforms, probabilistic methods.

UNIT-II

Image enhancement in the spatial domain: Some basic gray level transformations, Histogram processing, Enhancement using arithmetic/logic operations, Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters. **Image enhancement in the frequency domain**: Introduction to the Fourier transform and the frequency domain, Smoothing frequency domain filters, Sharpening frequency domain filters, homomorphic filtering.

UNIT-III

Image Restoration: A model of the image degradation/restoration process, Noise models, Restoration in the presence of noise only-spatial filtering, Periodic noise reduction by frequency domain filtering. **Morphological Image Processing**: Preliminaries, Dilation and erosion, Opening and closing, the hit-or-miss transformation, Some basic morphological algorithms.

UNIT-IV

Image Segmentation: fundamentals, point, Line, and Edge detection, Thresholding, Region-based segmentation, Segmentation by morphological watersheds. **Representation and description**: Representation, Boundary descriptors, Regional descriptors, Use of principal components for description, Relational descriptors.

Text Books:

1. Rafael C. Gonzalez and Richard E. Woods (2008), Digital Image Processing, 3rd Edition, Pearson Education.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle (2014), Image Processing, Analysis and Machine Vision, 4th Edition, Cengage Learning.

Reference Books:

1. A K. Jain, Fundamentals of digital image processing, Prentice Hall of India, 1989.
2. S Jayaraman, S Esakkirajan and T Veerakumar, Digital Image Processing, McGrawHill Edu2009.
3. Arthur R. Weeks, Jr., “Fundamentals of Electronic Image Processing”, First Edition, PHI,1996.

MCA212	CRYTOGRAPHY AND NETWORK SECURITY		CNS
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 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 Book:

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

Reference Books:

1. Davies & Price: Security for Computer Networks - Wiley
2. Mayer & Matyas: Cryptography - Wiley B. Schneider: Applied Cryptography - (John Wiley).

MCA213	MACHINE LEARNING		ML
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 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

Decision Tree Learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning. **Bayesian learning** – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibbs algorithm, Naïve Bayes classifier, an example learning to classify text, Bayesian belief networks The EM algorithm.

UNIT - III

Computational Learning Theory – Introduction, Probability Learning an Approximately Correct Hypothesis, Sample Complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The Mistake Bound Model of Learning. **Instance-Based Learning**- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

UNIT- IV

Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms. **Combining Inductive and Analytical Learning** – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators.

Text Book:

1. Machine Learning – Tom M. Mitchell, - MGH

Reference Book:

1. Introduction to Machine Learning,- Ethem Alpaydin, - PHI
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Franci

MCA214	THEORY OF COMPUTATION		TOC
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 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 expression, 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.

Reference Books:

1. Introduction to Formal Languages, Automata Theory and Computation, Kamala Krithivasan, Rama
2.Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3. Theory of Computation: A Problem – Solving Approach- Kavi Mahesh, Wiley.
4. "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI.

MCA215	ELECTIVE –I (A) DESIGN AND ANALYSIS OF ALGORITHMS		DAA
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I

Introduction to Algorithms: Algorithm Specification, Performance Analysis, Randomized Algorithms. **Elementary Data Structures**: Stacks and Queues, Trees, Dictionaries, Priority Queues, Sets and Disjoint Set Union, Graphs. **Divide and Conquer**: Binary Search, Finding the Maximum and Minimum, Merge Sort; Quick Sort, Selection sort, Strassen's Matrix Multiplication, Convex Hull.

UNIT-II

The Greedy Method: Knapsack Problem, Tree Vertex Splitting, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees, Single Source Shortest Paths. **Dynamic Programming**: General Method, Multistage Graphs, All-Pairs Shortest Paths, Single-Source Shortest Paths, Optimal Binary Search Trees, 0/1 Knapsack, The Traveling Salesperson Problem.

UNIT-III

Basic Traversal and Search Techniques: Techniques for Binary Trees, Techniques for Graphs, Connected Components and Spanning Trees, Biconnected Components and DFS. **Back Tracking**: General Method, 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles, Knapsack Problem. Branch-Bound: The Method, 0/1 Knapsack Problem, Traveling Sales Person.

UNIT-IV

NP-Hard and NP-Complete Problems: Basic Concepts, Cook's Theorem, NP-Hard. Graph Problems, NP-Hard Scheduling Problems, NP-Hard Code Generation, Some Simplified NP-Hard Problems.

Text Books:

1. E Horowitz, S Sahni, S Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, 2007.
2. Hari Mohan Pandey, "Design, Analysis and Algorithm", University Science Press, 2009.
3. TH Cormen, CE Leiserson, RL Rivert, C Stein, "Introduction to Algorithms‖, Third Edition, PHI, 2010.

MCA215	ELECTIVE –I (B) CLOUD COMPUTING		CC
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 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 - Conceptual Cloud Model - Cloud Service Defined.

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.
2. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014

Reference Books:

1. Cloud Computing, Roger Jennings, Wiley India
2. Cloud Computing Explained, John Rhoton, Recursive Press
3. Cloud Computing Bible, Barry Sosinsky, Wiley
4. Cloud Computing: Principles and Paradigms, RajkumarBuyya, James Broberg, Wiley
5. Cloud Computing for Dummies, Judith Hurwiz, Wiley Publishing.
6. The Cloud at your service, Rosenberg and Matheos, Manning Publications

MCA215	ELECTIVE –I (C) MOBILE COMPUTING		MC
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 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, tunnelling 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 (Chapters 11, 15, 17, 26 and 27) .

References Books:

1.Reza Behravanfar, “Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML”, ISBN: 0521817331, Cambridge University Press, October 2004.
2.Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden ,Schwiebert, Loren, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill Professional, 2005.
3.Hansmann, Merk, Nicklous, Stober, “Principles of Mobile Computing”, Springer, second edition, 2003.
4.Martyn Mallick, “Mobile and Wireless Design Essentials”, Wiley DreamTech, 2003.

MCA216	Digital Image Processing Laboratory	DIPL
WORK LOAD: 4 PPW	Credits : 2	EXTERNAL MARKS: 50

1. Introduction to Image Processing in Python
2. Installation steps.
3. NumPy and SciPy modules introduction
4. Example of reading images using glob and cropping the image.
5. Example of rotating the image without changing the shape:
6. Example of flipping the image in Python:
7. Example of applying Gaussian filter the image
8. Extracting Features of the image using edge detection and segmenting the image.
9. Example of segmenting the image using contours.
10. Example of interpolating the image:
11. Example of reading an image using OpenCV
12. Example of reading the image as grayscale and splitting it.
13. Example of binarizing the image using OpenCV.
14. Example of edge detection using OpenCV.

Note: The lab experiments/ Case studies in text book from four units shall be done using Python.

Reference Text Book:

1. Image Processing and Acquisition using Python by Ravishankar Chityala, Sridevi Pudipeddi, CRC Press, Taylor & Francis Group.

2. https://pythongeeks.org/image-processing-in-python/

MCA217	Machine Learning Laboratory	MLL
WORK LOAD: 4 PPW	Credits : 2	EXTERNAL MARKS: 50

Instructions:

1.Students may develop the assignments in Python.

2.Standard data sets or assumed data sets may be used for developing ML programs.

Assignments:

1. Design and evaluate a data model using Linear Regression.
2. Design and evaluate a data model using Logistic Regression.
3. Design and evaluate a data model using KNN.
4. Design and evaluate a data model using K Means Clustering.
5. Design and evaluate a data model using SVM.
6. Design and evaluate a data model using PCA.
7. Design and evaluate a data model using Decision Trees.
8. Design and evaluate a data model using Random Forest.
9. Compare the performance of all the above ML techniques on a similar data set using matplotlib.

Reference Books:

1. Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Müller, Sarah Guido, O'Reilly Media.

2. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben-David, Cambridge University, Press.

MCA218	Cryptography and Network Security **Laboratory**	CNSL
WORK LOAD: 4 PPW	**Credits : 2**	**EXTERNAL MARKS: 50**

1. Write a python/Java program to perform encryption and decryption using the following algorithms: a) Ceaser Cipher b) Substitution Cipher c) Hill Cipher

2. Write a python/Java program to implement the DES algorithm logic.

3. Write a python/Java program to implement RSA Algorithm.

4. Write a python/JAVA program to implement the Blowfish algorithm logic.

5. Write a python/JAVA program to implement the Rijndael algorithm logic.

6. Using python/Java Cryptography, encrypt the text “Hello world” using Blowfish.

7. Calculate the message digest of a text using the SHA-1 algorithm in JAVA/python.

8. Write a program to implement digital signature.

9. Compute common secret key between client and server using Diffie-Hellman key exchange technique. Perform encryption and decryption of message using the shared secret key (Use simple XOR operation to encrypt and decrypt the message).

10. Implement DSS algorithm for signing and verification of messages between two parties (obtain H (M) using simple XOR method of hash computation on M).

MCA219	Seminar	SEM
WORK LOAD: --	Credits: 1	INTERNAL MARKS: 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.

KAKATIYA UNIVERSITY, WARANGAL
DEPARTMENT OF COMPUTER SCIENCE
MCA COURSE STRUCTURE UNDER CBCS
WITH EFFECT FROM 2025-26

MCA II YEAR II SEMESTER

Paper No	Paper Title / Subject	Workload Per Week (Theory / Lab)	MARKS			Credits
			Internal	External	Total	
MCA221	Artificial Intelligence	T (4)	20	80	100	4
MCA222	Elective-II	T (4)	20	80	100	4
MCA223	Elective-III	T (4)	20	80	100	4
MCA224	Project	L (12)	--	200	200	8
MCA225	Comprehensive Viva	--	--	50	50	2
MCA226	Seminar	--	25	--	25	1
				Grand Total (Marks and Credits)	575	23

Elective – II

a. Software Engineering.
b. Software Project Management
c. Object Oriented Analysis and Design with UML

Elective – III

a. Natural Language Processing.
b. Deep Learning
c. Text Data Analytics

MCA221	ARTIFICIAL INTELLIGENCE		AI
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I:

Problem Solving by Search-I: Introduction to AI, Intelligent Agents. **Problem Solving by Search** –II: Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search. **Adversarial Search**: Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.

UNIT-II:

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems. **Propositional Logic**: Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic. **Logic and Knowledge Representation First-Order Logic**: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

UNIT-III:

Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution. **Knowledge Representation**: Ontological Engineering, Categories and Objects, Events. Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

UNIT-IV:

Planning - Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. **Learning**: Forms of Learning, Supervised Learning, Learning Decision Trees. **Knowledge in Learning**: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

Text Book:

1. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3Ed, Pearson

Reference Books:

1. Artificial Intelligence, 3rd Edn, E.Rich and K.Knight (TMH).
2. Artificial Intelligence, 3rd Edn, Patrick Henry Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

MCA222	ELECTIVE- II(A) SOFTWARE ENGINEERING		SE
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I

Introduction to Software Engineering: The evolving role of software, changing nature of software, softwaremyths. **A Generic view of process**: Software engineering- a layered technology, a process framework, the capability maturity model integration (CMMI), process patterns, process assessment, personal and team process models. **Process models**: The waterfall model, incremental process models, evolutionary process models, the unified process.

UNIT-II

Software Requirements: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. **Requirements Engineering Process**: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management. **System Models:** Context models, behavioral models, data models, object models, structured methods.

UNIT-III

Design Engineering: Design process and design quality, design concepts, the design model. **Creating an Architectural Design**: Software architecture, data design, architectural styles and patterns, architectural design, conceptual model of UML, basic structural modelling, class diagrams, sequence diagrams, collaboration diagrams, use case diagrams, component diagrams. **Testing Strategies**: A strategic approach to software testing, test strategies for conventional software, black-box and white-box testing, validation testing, system testing, the art of debugging.

UNIT-IV

Product Metrics: Software quality, metrics for analysis model, metrics for design model, metrics for source code, metrics for testing, metrics for maintenance. **Metrics for Process and Products**: Software measurement, metrics for software quality. Risk Management: Reactive Vs proactive risk strategies, software risks, risk identification, risk projection, risk refinement, RMMM, RMMM plan. **Quality Management**: Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McgrawHill
2. Software Engineering- Sommerville, 7th edition, Pearson Education.
3. Unified Modeling Language user guide Grady Booch, James Rambaugh, Ivar Jacobson,Pearson

Reference Books:

1. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiley.
2. Software Engineering principles and practice- Waman S Jawadekar, The Mc Graw-Hill
3. Fundamentals of object oriented design using UML Meiler page-Jones: Pearson Education.

MCA222	ELECTIVE- II (B) SOFTWARE PROJECT MANAGEMENT		SPM
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT -I

Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources- Six Sigma, Software Quality: defining software quality, ISO9126, External Standards.

UNIT-II

Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, structured methods.

UNIT-III

Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model.

UNIT-IV

Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.

Text Book:

1. Bob Hughes, Mike Cotterell & Rajib Mall “Software Project Management”, McGraw- Hill Publications, 6th Edition 2017.

Reference Books:

1. Ian Somerville, “Software Engineering”, 10th Edition, Pearson Education, 2017.
2. Robert T. Futrell , “Quality Software Project Management”, Pearson Education India, 2008.
3. Richard H.Thayer “Software Engineering Project Management”, 2nd Edition, Wiley, 2006.
4. S. A. Kelkar,” Software Project Management” PHI, New Delhi, Third Edition ,2013

MCA222	ELECTIVE- II (C) OBJECT ORIENTED ANALYSIS AND DESIGN WITH UML		OOAD
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I

Complexity: the inherent complexity of software, the five attributes of a complex system, Organized and Disorganized Complexity, bringing order to Chaos, on Designing complex systems. **The Object model:** The evolution of the object model, Foundations of the object model, Elements of the object model, Applying the object model, object-oriented system development life cycle.

UNIT-II

Classes and Objects: The nature of an object-Relationship among objects, The nature of a Class, Relationships among classes, The interplay of classes and objects, On building quality classes and objects. **Classification:** The importance of proper classification, Identifying classes and objects, Key abstraction and mechanisms.

UNIT-III

Notation: The unified modeling language-Package diagrams, Component diagrams. Deployment diagrams-Use case diagrams-Activity Diagrams-Class Diagrams-Sequence Diagrams-Interaction overview diagrams-Composite structure diagrams -State machine diagrams-Timing Diagrams-Object diagrams-communication diagrams.

UNIT- IV

Process: First principles-The Macro Process: The software development lifestyle-**The Micro Process:** The analysis and design process. **Pragmatics:** Management and planning Staffing- Release Management-Reuse-Quality assurance and metrics

Text Book:

1. Grady Booch, 2007. Object Oriented Analysis and Design, 3rd Edition, Addison Wesley, New Delhi.

Reference Books:

1. Martin Fowler, Kendall Scott, 2004. “UML Distilled”, 2nd Edition, Pearson Education,New Delhi.
2. James Rumbaugh, Ivar Jcobson and Grady Booch, 2003. “The Unified Modeling Language Reference Manual”, 1st Edition, Addison Wesley, New Delhi.
3. Boar, 2004. “Xml Web Services in The Organization”, Wp publisher

MCA223	ELECTIVE- III (A) NATURAL LANGUAGE PROCESSING		NLP
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT–I

Regular Expressions, Tokenization, Edit Distance: regular expressions, words, corpora, Word and Subword Tokenization, Word Normalization, Lemmatization and Stemming, Sentence Segmentation, Minimum Edit Distance. **N-gram Language Models:** N-Grams, **Evaluating Language Models:** Training, Test Sets and perplexity, ampling sentences from a language model, Generalizing vs. overfitting the training set, Smoothing, Interpolation, and Backoff, Perplexity's Relation to Entropy.

UNIT–II

Naive Bayes, Text Classification, and Sentiment: Naive Bayes Classifiers, Training the Naive Bayes Classifier, Optimizing for Sentiment Analysis, Naive Bayes as a Language Model, **Evaluation**: Precision, Recall, F-measure, Test sets and Cross-validation, Statistical Significance Testing, Avoiding Harms in Classification. **Logistic Regression:** The sigmoid function, Classification with Logistic Regression, Multinomial logistic regression, Learning in Logistic Regression, The cross-entropy loss function, Gradient Descent, Regularization, Learning in Multinomial Logistic Regression, Interpreting models.

UNIT-III

Vector Semantics and Embeddings: Lexical Semantics, Vector Semantics, Words and Vectors, Cosine for measuring similarity, TF-IDF: Weighing terms in the vector, Pointwise Mutual Information (PMI), Word2vec, Visualizing Embeddings, Semantic properties of embeddings, Bias and Embeddings, Evaluating Vector Models. **Machine Translation**: Language Divergences and Typology, Machine Translation using Encoder-Decoder, Details of the Encoder-Decoder Model, Decoding in MT: Beam Search, Translating in low-resource situations, MT Evaluation, Bias and Ethical Issues.

UNIT-IV

Sequence Labeling for Parts of Speech and Named Entities: (Mostly) English Word Classes, Part-of-Speech Tagging. Named Entities and Named Entity Tagging, HMM Part-of-Speech Tagging, Conditional Random Fields (CRFs), Evaluation of Named Entity Recognition. Context-Free Grammars and **Constituency Parsing:** Constituency, Context-Free Grammars, Treebanks, Grammar Equivalence and Normal Form, **CKY Parsing:** A Dynamic Programming Approach, Span-Based Neural Constituency Parsing, Evaluating Parsers, Heads and Head-Finding.

Text Book:

1. Daniel Jurafsky and James H. Martin, "Speech and Language Processing", 3rd Ed, 2008.

Reference Books:

1. Uday Kamath, John Liu, James Whitaker, "Deep Learning for NLP and Speech Recognition", Springer, 2020.
2. Allen, James, "Natural Language Understanding", Second Edition, Benjamin/ Cumming, 1995.
3. Sowmya Vajjala, Bodhisattwa Majumder, Anuj Gupta, Harshit Surana, "Practical Natural Language Processing: A Comprehensive Guide to Building Real-World NLP Systems", O'REILY, 2020.

MCA223	ELECTIVE- III (B) DEEP LEARNING		DL
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT-I

Machine Learning Basics: Learning Algorithms, Capacity, Over fitting and Underfitting,Hyperparameters and Validation Sets, Estimator, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Decent, building a Machine Learning Algorithm, challenges Motivating Deep Learning. **Fundamentals of Neural Networks**: Introduction to Neural Network, Model of Artificial Neuron, Learning rules and various activation functions.

UNIT-II

Neural Network Architecture: Single layer Feed-forward networks. Multi-layer Feed-forward networks. Recurrent Networks. **Back propagation Networks**: Back Propagation networks, Architecture of Back-propagation (BP) Networks, Back propagation Learning, Variation of Standard Back propagation algorithms. **Deep Neural Networks**: Introduction to Deep Neural Networks, training deep models, Training Deep Neural Networks using Back Propagation-Setup and initialization issues, Gradient- Descent Strategies, vanishing and exploding Gradient problems, regularizations, dropouts.

UNIT-III

Convolutional Neural Networks: Basic structure of Convolutional Network, the convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features., Convolutions for Images, Padding and Stride, Multiple Input and Multiple Output Channels.

UNIT-IV

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long short-term memory. **Practical Methodology**: Performance Metrics, Default Baseline Models, determining Whether toGather More Data, Selecting Hyper parameters, Debugging Strategies, Example: Multi-Digit Number Recognition.

Text Book:

1. Goodfellow I., BengioY., and Courville A., "Deep Learning", MIT Press, 2016, ISBN: 978-0262035613.
2. S.Rajasekaran and G.A. Vijayalakshmi Pai, "Neural Networks,Fuzzy Logic and Genetic Algorithms", PHI Learning Pvt. Ltd., 2003, ISBN:978-81-203-2186-1.

Reference Books:

1. Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola, "Dive into Deep Learning", Amazon Science, 2021.
2. Jacek M. Zurada,"Introduction to artificial neural systems", West Publishing Co., 1992, ISBN: 0-3 14-93391- 3.
3. Raúl Rojas, “Neural Networks: systematic Introduction” 1996.
4. Bishop C. M., "Pattern Recognition and Machine Learning", Springer, 2006, ISBN: 978-0-387-31073-2

MCA223	ELECTIVE- III (C) TEXT DATA ANALYTICS		TDA
WORK LOAD: 4 PPW	Credits:4	INTERNAL MARKS: 20	EXTERNAL MARKS: 80

UNIT– I

Introduction to Natural Language processing Basics, Language syntax and Structure (words, Phrases, clauses, & Grammar), Language Semantics processing, (Lexical Semantic relations, Homonyms, Homographs, and Homophones, Capitonyms, Hyponyms and Hypernyms), Text corpora (corpora Annotation and Utilities), Accessing Text Corpora (brown corpus, wordNet corpus) and NLP Applications (Machine Translation, Text Summarization and Text categorization)

UNIT–II

Concept of the Tokenization, Sentence tokenization, word tokenization, concept of the Text Normalization, (Cleaning Text, Removing Special characters, removing stop words, etc) correcting words using stemming and Lemmatization and understanding text syntax and structure (POS tagging and parsing).

UNIT–III

Concepts of feature extraction, methods of feature extraction (bag of words Model, TF-IDF Models, Advanced word Factorization Models likes word2vec), strengths and weakness of models and Word cloud. etc, Concepts of Document term matrix, Term Document Matrix.

UNIT-IV

Concepts of topic Modelling, Algorisms of Topic Modelling (Latent Semantic Indexing (LSI), Latent Dirichlet Allocation (LDA), non-negative matrix Factorization (NMF) ani Similarity based text clustering models), Text classification using supervised methods (Like Multinomial Naive Bayes, Support vector machines, Random Forest), concept of sentiment-Analysis and its applications. Sentence analysis and its applications. Sentence Subjectivity and sentiment classifications; Sentiment Lexicon generation and Summarization.

Text Book:

1. Dipnajan Sarkar: Text Analytics with python, A Press Publication

Reference Books:

1. Chapman & Hall, Handbook of Natural Language Processing, second Edition.
2. CRC: Machine Learning & pattern Recognition, 2nd Editio.
3. Christopher Manning and Hinrich Schuetze: Foundations of statistical Natural Language Processing.
4. Julia Silge: Text Mining with R: A Tidy approach, 1st Edition.

MCA224	Project		PROJ
WORK LOAD: 12 PPW	**Credits: 8**	**INTERNAL MARKS: --**	**EXTERNAL MARKS: 200**

NOTE:

- **The project work should be carried out by the Student groups and the number of students in each group should not exceed three.**

- **Two Seminars must be delivered by all the student groups before the final project viva, one on the design part and the other on the implementation.**

- The Project work, being the vital component of this professional programme, needs to be carried out with due care and dedication by all the student groups.

- The project work is not just the partial fulfilment of the course requirements, but it provides a mechanism to demonstrate the ASK (Attitude, Skills, and Knowledge) elements with specialization.

- The students are expected to work on a real-time project on latest platforms preferably in some industrial unit/ R & D Laboratories / Educational Institution / Software Company.

- Students are encouraged to work in their interested area.
- The student groups can formulate a project problem by a thorough interaction with his / her Guide of the concerned college.

- Approval of the project proposal is mandatory by his/her Guide, and then only the student group is expected to commence working on and complete it.

- The student groups must make use of the latest software packages for the development of the project.

- The problem domain and the specifications chosen should be genuine and feasible for the implementation.

MCA225	COMPREHENSIVE VIVA	CV
WORK LOAD: --	Credits: 2	INTERNAL MARKS: 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.

MCA226	Seminar	SEM
WORK LOAD: --	Credits: 1	INTERNAL MARKS: 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.

PATTERN OF QUESTION PAPER
FACULTY OF SCIENCE
MCA (I/II/III/IV SEMESTER) EXAMINATION
PAPER TITLE:

Time: 3 hours Max. Marks: 80

Section A **answer all questions** **(8 X 2 = 16)**

1. (a) unit I
   (b)unit I
   (c)unit II
   (d)unit II
   (e)unit III
   (f)unit III
   (g)unit IV
   (h)unit IV

Section B **Answer all questions** **(4 X 16 = 64)**

2. (a) unit I
   (b) unit I
   OR
   (c) unit I
   (d)unit I

3. (a) unit II
   (b) unit II
   OR
   (c) unit II
   (d) unit II

4. (a) unit III
   (b) unit III
   OR
   (c) unit III
   (d)unit III

5. (a) unit IV
   (b) unit IV
   OR
   (c) unit IV
   (d) unit IV

KAKATIYA UNIVERSITY
FACULTY OF SCIENCE
MCA (I/II/III/IV SEMESTER)
FIRST INTERNAL EXAMINATION QUESTION PAPER PATTERN
PAPER TITLE:

Time : 1 Hour Max. Marks: 20

Answer ALL Questions. Each question carries equal marks (2 X 10 = 20)

1. From Unit I.
2. From Unit I
3. From Unit I
4. From Unit I
5. From Unit I
6. From Unit II
7. From Unit II
8. From Unit II
9. From Unit II
10. From Unit II

KAKATIYA UNIVERSITY
FACULTY OF SCIENCE
MCA (I/II/III/IV SEMESTER)
SECOND INTERNAL EXAMINATION QUESTION PAPER PATTERN
PAPER TITLE:

Time: 1 Hour Max. Marks: 20

Answer ALL Questions. Each question carries equal marks (2 X 10 = 20)

1. From Unit III.
2. From Unit III
3. From Unit III
4. From Unit III
5. From Unit III
6. From Unit IV
7. From Unit IV
8. From Unit IV
9. From Unit IV
10. From Unit IV