



# RAYALASEEMA UNIVERSITY

(A State University Established by the Govt. of A.P)  
Kurnool (A.P.) 518 002

**Dr.G.Ravi Kumar**  
Co-ordinator  
Department of Computer Science

E-mail: grkondaravi@gmail.com  
cell: 8555919531

Date: 18/01/2021

To  
The Registrar  
Rayalaseema University  
Kurnool  
Respected Sir,

**Sub:** Department of Computer Science – Constitution of Board of Studies for MCA 2 years Course – Appointment of Chairman – Request – reg.


@@@

With reference to the subject mentioned above, The AICTE decided to reduce the MCA Course from 3 years to 2 years for this academic Year 2020-21. The Department should revise the curriculum of MCA for 2 years. Our previous chairman, BoS, Prof.C.Locknath Reddy, Dravidian University, retired. The Department also wants to revise the M.Sc (Computer Science) course.

In this regard, I request your good self to direct the concerned to take necessary steps to appoint the Chairman, BoS for the MCA (2 years) and M.Sc (Computer Science) Programs.

Thanking you sir,

**FORWARDED**

  
18/1/21  
PRINCIPAL  
University College of Science  
Rayalaseema University  
Copy to: Kurnool-518007

Yours faithfully



Coordinator  
Head Department of Computer Science  
Rayalaseema University,  
Kurnool.

1) P.A to Vice Chancellor, Rayalaseema University, Kurnool





# RAYALASEEMA UNIVERSITY:KURNOOL

(UGC 2 (f) & 12B, accredited by NAAC with 'B' Grade)

Prof. R.Sanjeeva Rao, Dean

Academic Affairs

Email: deanacademicru@gmail.com

Ph:9494481961

No.RU/Academics/RU Science College /BoS/Members/2020-21  
2021

Date: 17-02-

Sir,

**Sub:-** Academic Affairs – Department of Computer Science, RU Science College, Rayalaseema University, Kurnool – Constitution of Board of Studies – Appointment of Members – Orders – Issued.

**Ref:-** Vice-Chancellor's orders dated: 16-02-2021.

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I am by direction to inform that the following members are nominated as Chairman / Members in the Board of Studies, Department of Computer Science, Rayalaseema University Science College, Kurnool.

S.No	Name, Designation	BoS Role	e-mail ID	Contact No.
1	Prof. A.Suresh Babu Head, Dept. of Computer Science & Engineering JNTUA College of Engineering (Autonomous) Ananthapuramu – 515002	Chairperson	<a href="mailto:asureshjntu@gmail.com">asureshjntu@gmail.com</a>	9440388093.
2	Dr.B.Venkata Ramana Associate Professor Dept. of Computer Science & Engineering IIT, Tirupati	Member	<a href="mailto:ramana@iittp.ac.in">ramana@iittp.ac.in</a>	0877- 2503212
3	Dr.S.Ravi Chandra Dept. of Computer Science & Engineering NIT, Warangal	Member	<a href="mailto:ravic@nitw.ac.in">ravic@nitw.ac.in</a>	8702462730
4	Prof.B.Satyanarayana Dept.of Computer Science and Technology S K University, Anantapur	Member	<a href="mailto:bachalasadtya@yahoo.com">bachalasadtya@yahoo.com</a>	9849304906
5	Raghavendra Srikonda Deloitte Consulting India Private Ltd, Deloitte Tower I, Deloitte Towers, Survey No.14 Gachibowli Village, Hyderabad	Member		
6	Dr.Y.Madhusudan Reddy, Assistant Professor Dept. of Computer Science & Engineering RGM Engg College, Nandyal	Member	<a href="mailto:ymsr1016@gmail.com">ymsr1016@gmail.com</a>	9440486567
7	Dr.G.Murali, Assistant Professor Dept. of Computer Science & Engineering JNTUA College of Engineering (Autonomous) Pulivendala	Member	<a href="mailto:Muralig521@gmail.com">Muralig521@gmail.com</a>	9492470822

The term of appointment shall be for a period of Two years with effect from the date of this order or till the new Board of Studies is constituted. The Members will be governed by the rules and regulations that are in force in the University and that may be amended from time to time.

These orders shall come into force with immediate effect.

DEAN

ACADEMIC AFFAIRS

DEAN

ACADEMIC AFFAIRS  
RAYALASEEMA UNIVERSITY  
KURNOOL - 518007 (A.P)

To

The Chairperson, BoS(Computer Science), RU Science College

All the members of Board of Studies as above.

The Coordinator, Dept.of Computer Science, RU Science College, Kurnool

The Rector, Rayalaseema University, Kurnool.

The Dean (Examinations) / Dean (Academics), Rayalaseema University, Kurnool.

The Principal, RU Science College, Kurnool.

Copy to PA to Vice-Chancellor / The Registrar, Rayalaseema University, Kurnool.

Copy to The Asst. Registrar – Establishment / Finance Sections, RU, Kurnool.

Copy to file.

**MASTER OF COMPUTER APPLICATIONS (MCA)**  
**Effective from Academic Year 2020-21 Admitted Batch**

**COURSE STRUCTURE & SYLLABUS (R20)**

**I YEAR I SEMESTER**

<b>Category</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Core Course - I	Mathematical and Statistical Foundations	3	0	0	3
Core Course - II	C and Data Structures	3	1	0	4
Core Course – III	Database Management Systems	3	0	0	3
Core Course – IV	Operating Systems	3	0	0	3
Core Course – V	Computer Organization	3	0	0	3
Laboratory – I	Data Structures through C Lab	0	0	3	1.5
Laboratory – II	Database Management Systems Lab	0	0	3	1.5
Laboratory – III	Operating Systems Lab	0	0	3	1.5
	<b>Total Credits</b>	<b>15</b>	<b>1</b>	<b>9</b>	<b>20.5</b>

**I YEAR II SEMESTER**

<b>Category</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Core Course - I	Object Oriented Programming using JAVA	3	0	0	3
Core Course - II	Python Programming	3	0	0	3
Core Course – III	Business English and soft skills	1	0	3	2.5
Core Course – IV	Machine Learning	3	0	0	3
Core Course – V	Software Engineering	3	0	0	3
Core Course-VI	Design and Analysis of Algorithms	3	0	0	3
Laboratory – I	Python Programming Lab	0	0	4	2
Laboratory – II	Software Engineering Lab	0	0	3	1.5
Laboratory – III	Object oriented Programming using JAVA Lab	0	0	3	1.5
	<b>Total Credits</b>	<b>16</b>	<b>0</b>	<b>13</b>	<b>22.5</b>

## II YEAR I SEMESTER

Category	Course Title	L	T	P	Credits
Core Course - I	Cloud Computing	3	0	0	3
Core Course - II	Web Technologies	3	0	0	3
Core Course – III	Internet of Things	3	0	0	3
Core Course – IV	Computer Networks	3		0	3
Professional Elective - I	<b>Professional Elective I</b> Artificial Intelligence Foundations of Data Science Ad-hoc and Sensor Networks	3	0	0	3
Professional Elective - II	<b>Professional Elective II</b> Cyber Security Mobile Application Development Software Testing Methodologies	3	0	0	3
Laboratory – I	Internet of Things Lab	0	0	3	1.5
Laboratory – II	Cloud Computing Lab	0	0	3	1.5
Laboratory – III	Web Technologies Lab	0		3	1.5
Laboratory –IV	Computer Networks lab	0		3	1.5
	<b>Total Credits</b>	<b>15</b>	<b>1</b>	<b>8</b>	<b>23</b>

Cloud Computing\*: AWS, Aneka and azure

## II YEAR II SEMESTER

Category	Course Title	L	T	P	Credits
Professional Elective - III	Agile and Devops Design Patterns Big Data Analytics	3	0	0	3
Professional Elective - IV	e-Commerce Cyber Laws and Privacy Entrepreneurship	3	0	0	3
Seminar	Technical Seminar	0	0	4	2
Project	Project work	0	0	20	10
	<b>Total Credits</b>	<b>6</b>	<b>0</b>	<b>24</b>	<b>18</b>



**Department of Computer Science**  
**MCA (R20)**  
**Mathematical and Statistical Foundations**

SEMESTER - I

L-T-P-C: 3-0-0-3

**UNIT I:**

**Basic Probability and Random Variables:** Random Experiments, Sample Spaces Events, the Concept of Probability the Axioms of Probability, Some Important Theorems on Probability Assignment of Probabilities, Conditional Probability Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule. Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables

**UNIT II:**

**Sampling and Estimation Theory:** Population and Sample, Statistical Inference Sampling With and Without Replacement Random Samples, Random Numbers Population Parameters Sample Statistics Sampling Distributions, Frequency Distributions, Relative Frequency Distributions, Computation of Mean, Variance, and Moments for Grouped Data. Unbiased Estimates and Efficient Estimates Point Estimates and Interval Estimates. Reliability Confidence Interval Estimates of Population Parameters, Maximum Likelihood Estimates

**UNIT III:**

**Tests of Hypothesis and Significance:** Statistical Decisions Statistical Hypotheses. Null Hypotheses Tests of Hypotheses and Significance Type I and Type II Errors Level of Significance Tests Involving the Normal Distribution One-Tailed and Two-Tailed Tests P Value Special Tests of Significance for Large Samples Special Tests of Significance for Small Samples Relationship between Estimation Theory and Hypothesis Testing Operating Characteristic Curves. Power of a Test Quality Control Charts Fitting Theoretical Distributions to Sample Frequency Distributions, The Chi-Square Test for Goodness of Fit Contingency Tables Yates' Correction for Continuity Coefficient of Contingency.

**UNIT IV:**

**Algebraic Structures and Number Theory:** Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

**UNIT V:**

**Graph Theory:** Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices,

Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multigraphs, Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

**Text Books:**

1. Foundation Mathematics for Computer Science, 1<sup>st</sup> Edition, John Vince, Springer, 2015
2. Probability & Statistics, 3<sup>rd</sup> Edition, Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers, 2018
3. Probability and Statistics with Reliability, 2<sup>nd</sup> Edition, K. Trivedi, Wiley, 2011
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7<sup>th</sup> Edition, H. Rosen, Tata McGraw Hill, 2003

**Reference Books:**

1. Probability and Computing: Randomized Algorithms and Probabilistic Analysis, 1<sup>st</sup> Edition, M. Mitzenmacher and E. Upfal, 2005
2. Applied Combinatorics, 6<sup>th</sup> Edition, Alan Tucker, Wiley, 2012

## Department of Computer Science

### MCA (R20) C and Data Structures

SEMESTER - I

L-T-P-C: 3-1-0-4

#### UNIT - I :

**Introduction to C:** Constants and variables, Operators and Expressions, Managing Input and Output operators, Decision making-branching and looping, Arrays,

#### UNIT-II:

Functions, Structures and Unions, Pointers, File handling in C.

#### UNIT – III :

**Data structure:** Definition, types of data structures Recursion Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion. Preliminaries of algorithms, analysis and complexity .**Linear list** – singly linked list, Double linked list and circular linked list - implementation, insertion, deletion and searching operations on linear list.

#### UNIT - IV :

**Stacks**-Operations, array and linked representations of stacks, stack applications, **Queues**-operations, array and linked representations. **Hash Table Representation:** hash functions, collision resolution-separate chaining, open addressing-linear probing, quadratic probing, double hashing and rehashing, extendible hashing.

#### UNIT - V:

**Sorting Techniques:** Insertion sort, selection sort, exchange-bubble sort, quick sort and merge sort Algorithms. **Trees:** Binary Trees, terminology, representation and traversals- pre, post & in order traversals. **Search Trees:** Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion

#### Text Books:

1. Programming in ANSI C, 5e, E. Balaguruswamy, TMH
2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
3. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

#### Reference Books:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.

## Department of Computer Science

### MCA (R20)

#### Database Management Systems

SEMESTER - I

L-T-P-C: 3-0-0-3

#### Unit-I:

**Introduction to Databases:** Introduction, An Example, Characteristics of the Database Approach, Actors on Scene, Workers behind the scene, Advantages of Using the DBMS Approach, A Brief History of Database Applications, When Not to Use a DBMS **[TB-3]**

**Overview of Database Languages and Architectures:** Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment, Centralized and Client/Server Architecture for DBMSs, Classification of Database Management Systems **[TB-3]**

#### Unit-II:

**Introduction to Database Design:** Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model, Conceptual Design for Large Enterprises **[TB-1]**

**Relational Model:** Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/Altering Tables and Views **[TB-1]**

#### Unit-III:

**Relational Algebra:** Selection and Projection, Set Operations, Renaming, Joins, Division, More Examples of Algebra Queries **[TB-1]**

**SQL: Queries, Constraints, Triggers:** The Form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Databases, Designing Active Databases **[TB-1]**

#### Unit-IV:

**Introduction to Normalization Using Functional and Multivalued Dependencies:**

Informal Design Guidelines for Relation Schema, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form **[TB-3]**

#### Unit-V:

**Transaction Management and Concurrency Control:** Transaction Concept, A Simple Transaction Model, Storage Structure, ACID Properties, Serializability, Transaction Isolation Levels, Concurrency Control, Lock-Based Protocols, Validation-Based Protocols **[TB-2]**

**Note: For Practical Examples Please Go Through Reference 1**



**Text Books:**

1. Data base Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, Mc Graw-Hill
2. Data base System Concepts, 6/e, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Mc Graw-Hill
3. Database Systems, 6/e Ramez Elmasri, Shamkant B. Navathe, Pearson

**Reference Books:**

1. Database Systems, 9/e, Carlos Coronel, Steven Morris, Peter Rob, Cengage
2. Introduction to Database Systems, 8/e, C J Date, Pearson

## Department of Computer Science

### MCA (R20) Operating Systems

SEMESTER - I

L-T-P-C: 3-0-0-3

#### UNIT-I:

**Introduction to Operating System Concept:** Types of Operating Systems, Operating Systems Concepts, Operating System Operations. Operating Systems Structures- Operating System Services, User Operating-System Interface, Introduction to System calls, Types of System Calls.

#### UNIT-II:

**Process Management:** Process concept, Process State Diagram, Process control block, Process Scheduling, Inter process Communication, Threads-Threading Issues, Scheduling- Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

#### UNIT-III:

**Process Synchronization:** The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, **Principles of deadlock:** System Model, Deadlock characterization, Deadlock handling, Deadlock Prevention, Detection and Avoidance, Recovery Starvation, Critical Regions form Deadlock

#### UNIT-IV:

**Memory Management:** Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation Virtual Memory Management-Demand Paging, Page-Replacement Algorithms, Thrashing. **File-System Interface:** File Concept, Access Methods, Directory structure, File-System mounting, Files Sharing, Protection. File-System implementation- File-System Structure, Allocation Methods, Free-Space Management, Disk Structure, Disk Scheduling

#### UNIT-V:

**Case Studies: Linux System:** Design Principles, kernel Modules, Process Management, File Systems, Input and Output, Interprocess Communication, Network Structure, Security. **Windows7:** Design Principles, System Components, Terminal Services and Fast User, File System, Networking, Programmer Interface.

#### Text Books:

1. Operating system concepts, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, John Wiley & Sons, Inc., Edition 9, 2011
2. Introduction to UNIX and Shell Programming, M. G. Venkateshmurthy, Pearson, 2005
3. UNIX & Shell Programming by B.M. Harwani, OXFORD University Press, 2013

**Reference Books:**

1. Advanced Programming in the UNIX Environment by W. Richard Stevens, Stephen Rago, Wesley Professional, 2013
2. UNIX Network Programming by W. Richard Stevens, 1990
3. Operating systems, William stallings, PHI/Pearson, 6/E, 2009
4. Operating systems, Dietal, Dietal, Pearson, 3/e, 2007
5. Operating systems, Dhamdhere, TMH, 2/e, 2009

**Web Reference:**

**[https://onlinecourses.swayam2.ac.in/cec20\\_cs06/preview](https://onlinecourses.swayam2.ac.in/cec20_cs06/preview)**

## Department of Computer Science

### MCA (R20) Computer Organization

SEMESTER - I

L-T-P-C: 3-0-0-3

#### UNIT I:

**Basic Structure Of Computers: Computer** Types, Functional units, Basic Operational concepts, Bus structures, Software, Performance, multiprocessor and multi computers, Historical perspective.

#### UNIT II:

**Machine Instructions and Programs:** Numbers, Arithmetic Operations, and c Characters, Memory locations and addresses, Memory operations, Instructions and Instruction sequencing, Addressing Modes, Assembly Languages, stacks and Queues Basic Input/output Operations, role of Stacks and Queues Additional Instructions

#### UNIT III:

**Input/ Output Organization:** Accessing I/O Devices, Interrupts, Processor examples, Direct Memory Access, Buses, Interface Circuits, and Standard I/O Interfaces

#### UNIT IV:

**The Memory Systems:** Some Basic concepts, Semi conductor RAM memories, Memory System Consideration, Read-Only Memories, Speed, Size, and cost, Cache Memories, Performance considerations, Virtual Memories, Memory Management Requirements, Secondary Storage

#### UNIT V:

**Parallel Processing:** Basic concepts, Pipeline Processors, Multiprocessors

#### Text Books:

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization , John P. Hayes ,3<sup>rd</sup> Edition, McGraw Hill

#### Reference Books:

1. Computer Organization and Architecture, William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization, Andrew S. Tanenbaum, 4th Edition PHI/Pearson

Fundamentals of Computer Organization and Design, Sivarama Dandamudi  
Springer Int. Edition.

## Department of Computer Science

### MCA (R20)

Data Structures through C Lab

SEMESTER - I

L-T-P-C: 0-0-3-1.5

#### Experiment 1:

- Write a program in C to display the n terms of even natural number and their sum.
- Write a program in C to display the n terms of harmonic series and their sum.  $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$  terms.
- Write a C program to check whether a given number is an Armstrong number or not.
- Write a C program to calculate the factorial of a given number.

#### Experiment 2:

- Write a program in C for multiplication of two square Matrices.
- Write a program in C to find transpose of a given matrix.

#### Experiment 3:

- Write a program in C to check whether a number is a prime number or not using the function.
- Write recursive program which computes the n<sup>th</sup> Fibonacci number, for appropriate values of n.
- Write a program in C to add numbers using call by reference.

#### Experiment 4:

- Write a program in C to append multiple lines at the end of a text file.
- Write a program in C to copy a file in another name.

#### Experiment 5:

Write recursive program for the following

- Write recursive and non recursive C program for calculation of Factorial of an integer.
- Write recursive and non recursive C program for calculation of GCD (n, m)
- Write recursive and non recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

#### Experiment 6:

- Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
- Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

#### Experiment 7:

- Write C program that implement stack (its operations) using arrays.
- Write C program that implement stack (its operations) using Linked list.



**Experiment 8:**

- a) Write a C program that uses Stack operations to convert infix expression into postfix expression.
- a) Write C program that implement Queue (its operations) using arrays.
- b) Write C program that implement Queue (its operations) using linked lists.

**Experiment 9:**

Write a C program that uses functions to create a singly linked list and perform various operations on it.

**Experiment 10:**

Write a C program to store a polynomial expression in memory using linked list and perform polynomial addition.

**Experiment 11:**

- a) Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.
- b) Write a non recursive C program for traversing a binary tree in preorder, inorder and postorder.

**Experiment 12:**

- a) Write a C program to implement Prims' algorithm.
- b) Write a C program to implement Kruskal's algorithm.

**Experiment 13:**

Implementation of Hash table using double hashing as collision resolution function.

**Experiment 14:**

Implementation of Binary Search trees- Insertion and deletion.

**Experiment 15:**

Implementation of AVL Tree – Insertion and Deletion

**Experiment 16:**

- a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order.
- b) Write C program that implement Quick sort, to sort a given list of integers in ascending order.
- c) Write C program that implement merge sort, to sort a given list of integers in ascending order

## Department of Computer Science

### MCA (R20)

#### Operating Systems Lab

SEMESTER - I

L-T-P-C: 0-0-3-1.5

#### UNIX Lab- Introduction to Unix

1. Study of Unix/Linux general purpose utility commands
2. Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system .
3. Study of UNIX/LINUX File System(tree structure).
4. C program to emulate the UNIX ls -l command
5. C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls -l | sort
6. Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (), System calls

#### Operating Systems Lab

1. Simulate the Following CPU Scheduling Algorithms  
A) FCFS B) SJF C) Priority D) Round Robin
2. Multiprogramming-Memory Management- Implementation of fork(), wait(), exec() and exit()
3. Simulate The Following
  - a. Multiprogramming with A Fixed Number Of Tasks (MFT)
  - b. Multiprogramming with A Variable Number Of Tasks (MVT)
4. Write a program to implement first fit, best fit and worst fit algorithm for memory management.
5. Simulate Bankers Algorithm for Dead Lock Avoidance
6. Simulate Bankers Algorithm for Dead Lock Prevention.
7. Simulate The Following Page Replacement Algorithms.
  - a) FIFO
  - b) LRU
  - c) LFU
8. Simulate the Following File Allocation Strategies
  - a) Sequenced
  - b) Indexed
  - c) Linked

#### Linux Lab

1. Write a Shell program to check whether given number is prime or not.
2. Write a shell script which will display Fibonacci series up to the given range.
3. Write a shell script to check whether the given number is Armstrong or not.
4. Write a shell script to calculate the value of
5. Write a shell script to accept student number, name, marks in 5 subjects.

6. Find total, average and grade using the following rules:
  - Avg $\geq$ 80 then grade A
  - Avg $<$ 80&&Avg $\geq$ 70 then grade B
  - Avg $<$ 70&&Avg $\geq$ 60 then grade C
  - Avg $<$ 60&&Avg $\geq$ 50 then grade D
  - Avg $<$ 50&&Avg $\geq$ 40 then grade E
7. Write a shell script to find minimum and maximum elements in the given list of elements.
8. Write a shell program to check whether the given string is palindrome or not.
9. Write an awk program to print sum, avg of students marks list
10. Write a shell script to compute no. of characters and words in each line of given file
11. Write a shell script to check whether the given input is a number or a string

## Department of Computer Science

### MCA (R20)

#### Data Base Management Systems Lab

SEMESTER - I

L-T-P-C: 0-0-3-1.5

1. Execute all DDL, DML and DCL commands on sample tables.
2. Implementation of different types of operators and built-in functions with suitable examples
3. Implementation of different types of joins with suitable examples
4. Create views, partitions, Sequence, Indexes and locks for a particular DB
5. Implement different types of constraints on relations.
6. Implementation of sub queries and nested queries.
7. Implement Queries on Group By & Having Clauses, ALIAS, Sequence By, Order By
8. Control Structure
  - a) Write a PL/SQL block for Addition of Two Numbers
  - b) Write a PL/SQL block for IF, IF and else condition
  - c) Write a PL/SQL block for implementation of loops
  - d) Write a PL/SQL block for greatest of three numbers using IF ANDElseIF
9. Exception Handling- Implement the following with respect to exception handling.

Raising Exceptions, User Defined Exceptions, Pre-Defined Exceptions
10. Write PL/SQL block for an application using exception handling  
*Procedures*
  - a) Write a PL/SQL Procedure using Positional Parameters
  - b) Write a PL/SQL Procedure using notational parameters
  - c) Write a PL/SQL Procedure for GCD Numbers
  - d) Write a PL/SQL Procedures for cursor implementation (explicit and implicit cursors)
11. *Functions:*
  - a) Write a PL/SQL block to implement factorial using functions
  - b) Write a PL/SQL function to search an address from the given database
12. Write a DBMS program to prepare Pl/SQL reports for an application using functions.
13. Triggers:
  - a) Write a Trigger to pop-up the DML operations
  - b) Write a Trigger to check the age valid or not Using Message Alert.
  - c) Create a Trigger to Raise appropriate error code and error message.
  - d) Create a Trigger on a table so that it will update another table while inserting values
14. Write PL/SQL block for an application using cursors and all types of triggers.

15. Write a PL/SQL block for transaction operations of a typical application using package

**Text Books / Suggested Readings:**

1. Oracle: The Complete Reference by Oracle Press
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007



# **RAYALASEEMA UNIVERSITY**

**Kurnool (A.P)-518007**

(A State University Established by the Govt. of A.P)

**DEPARTMENT OF COMPUTER SCIENCE**

## **MCA-II Semester Syllabus**

**COURSE STRUCTURE FOR MCA- II SEMESTER**

**Effective from Academic Year 2020- 2021 admitted batch**

### **MCA-I YEAR II-SEMESTER**

<b>Category</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Core Course - I	Object Oriented Programming using JAVA	3	0	0	3
Core Course - II	Python Programming	3	0	0	3
Core Course – III	Business English and soft skills	1	0	3	2.5
Core Course – IV	Machine Learning	3	0	0	3
Core Course – V	Software Engineering	3	0	0	3
Core Course-VI	Design and Analysis of Algorithms	3	0	0	3
Laboratory – I	Python Programming Lab	0	0	4	2
Laboratory – II	Software Engineering Lab	0	0	3	1.5
Laboratory – III	Object oriented Programming using JAVA Lab	0	0	3	1.5
	<b>Total Credits</b>	<b>16</b>	<b>0</b>	<b>13</b>	<b>22.5</b>



## Object Oriented Programming using JAVA

### UNIT-I:

**Object oriented thinking and Java Basics:** Need for oop paradigm, summary of oop concepts, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, using final with variables, garbage collection, overloading methods and constructors, recursion, nested and inner classes, exploring string class.

### UNIT-II:

**Inheritance:** Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance and methods, polymorphism- method overriding, abstract classes, the Object class. Packages: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

### UNIT-III:

**Interfaces:** Differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exception Handling: Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. String handling, Exploring java.util

### UNIT-IV:

**Event Handling:** Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. Handling menus, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag. Swing: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swingJApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

### UNIT-V:

**Applets:** Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Multithreading:

Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter-thread communication, thread groups.

**TEXT BOOKS:**

1. Java the complete reference, Herbert schildt, 7th edition, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson edition.

**REFERENCE BOOKS:**

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. An Introduction to OOP, T. Budd, 3rd edition, Pearson education.
3. Introduction to Java programming, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object-oriented application development, R.A. JohnsonThomson.
5. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary.
6. Cornell, 8th Edition, Pearson Education.
7. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, 8th Edition, Pearson Education.
8. Object Oriented Programming with Java, R. Buyya, S. T. Selvi, X. Chu, TMH.
9. Java and Object Orientation, an introduction, John Hunt, 2nd edition, Springer.
10. Maurach's Beginning Java2 JDK 5, SPD.
11. Programming and Problem Solving with Java, JM Slack, B S Publication

# PYTHON PROGRAMMING

## Unit – I

**Introduction:** What is a program, Running python, Arithmetic operators, Value and Types.  
**Variables, Assignments and Statements:** Assignment statements, Script mode, Order of operations, string operations, comments.

**Functions:** Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

## Unit – II

**Case study:** The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

**Conditionals and Recursion:** floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.

**Fruitful Functions:** Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types.

## Unit – III

**Iteration:** Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.

**Strings:** A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

**Case Study:** Reading word lists, Search, Looping with indices.

**Lists:** List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

## Unit – IV

**Dictionaries:** A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.

**Tuples:** Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

**Files:** Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

**Classes and Objects:** Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying. Classes and Functions:

## Unit – V

**Classes and Functions:** Time, Pure functions, Modifiers, Prototyping versus Planning

**Classes and Methods:** Object oriented features, Printing objects, The init method, The `__str__` method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

**Inheritance:** Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

**The Goodies:** Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args,

### Text books:

1. Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.

### Reference Books:

1. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
3. R. Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019

## **Business English and soft skills**

### **UNIT I:**

Listening: Barriers of Listening skill-Approaches to Listening –How to improve Listening exercises. Speaking: Paralanguage: Sounds, stress, intonation- Art of conversation – Presentation skills – Public speaking- Expressing Techniques.

### **UNIT II:**

Reading: Kinds of Reading – Causes of reading difficulties – Reading strategies – exercises. Writing: Effective writing – Paragraph – Essay- Reports – Letters- Articles – Notices, Agenda & Minutes.

### **UNIT III:**

Communication: Modes of Communication- Barriers – Interpersonal skills – Negotiation skills – Non- Verbal communication - Etiquettes.

### **UNIT IV:**

Group Dynamic skills: Group Discussion – Team building & Team work – Be a manager or leader – Decision making – creativity – Time & Stress management skills.

### **UNIT V:**

Interview skills: Types of Interviews – Preparing for interview – Preparing a CV – Structuring the interview \_ Mock Interview \_ Quick Tips.

### **Text Books & Reference Books:**

1. Sanghi, Seema, Improve your communication skills. 2nd edition.
2. Burnard, Philip. Interpersonal skills Training: A source book of activities. 2005.

3. Ashley, Roderic. How to enhance your employability. 1998.
4. Dr. Alex, K. Soft skill: know yourself & Know the world. 2010.
5. Cornerstone. Developing softskills. 4th edition 2005.
6. Jones, Daniel. An outline of English phonetics.
7. Aggarwal, Rohini. Business communication and Organization & Management.
8. Grath. E.H. Basic Managerial skills for all.
9. Maxwell, John C. Developing the leader within you

## **MACHINE LEARNING**

### **Unit -I:**

Introduction: Definition-Examples of machine learning applications – Well posed learning problems- Designing a learning system- Perspectives and issues Concept learning and general to specific ordering: Inductive learning hypothesis- Concept learning as search – candidate elimination algorithm-inductive bias.

### **Unit - II:**

Regression and classification - Regression: Linear Regression-Simple-Multiple Decision Tree-Pruning: Introduction –Representation-Algorithm issues Classification: Support Vector machine – Naïve Bayes-Applications.

### **Unit - III:**

Clustering and Learning - Clustering: k-Means clustering– adaptive Hierarchical clustering – Applications- Neural network : Perceptron, multilayer network- back propagation-introduction to deep neural network Instance based learning :k-NN– Radial basis functions Case based reasoning Reinforcement learning -Applications.

### **Unit - IV:**

Probabilistic graphical models- Graphical Models: Undirected graphical models - Markov Random Fields - Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning Generalization - Hidden Markov Models - Conditional random fields(CRFs).

### **Unit - V:**

Machine learning experiments - Design-Cross validation - Measuring Performance - Hypothesis testing- Assessing Performance -Comparison of algorithms, Datasets-Case study.



**Text Books:**

1. Tom M. Mitchell, Machine learning, McGraw-Hill, 1997.
2. Ethem Alpaydin, Introduction to Machine Learning, MIT Press, 3rd Edition, 2014.
3. E. Alpaydin, Introduction to Machine Learning, MIT Press, 2nd Edition, 2009.

**Reference Books:**

1. P. Harrington, Machine learning in action, Manning Publications Co, 2012.
2. C. M. Bishop Pattern recognition and Machine Learning, Springer, 2007.
3. J. Bell, Machine Learning for Big Data, Wiley, 2014.

## **SOFTWARE ENGINEERING**

**Unit – I: Basic concepts in software engineering and software project management**

Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, Organization and team structure, risk management, configuration management.

**Unit – II: Requirements analysis and specification**

The nature of software, The Unique nature of Webapps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE 830 guidelines, representing complex requirements using decision tables and decision trees, overview of formal system development techniques. axiomatic specification, algebraic specification.

**Unit – III : Software Design**

Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function oriented design. Overview of SA/SD methodology, structured analysis, Data flow diagram, Extending DFD technique to real life systems, Basic Object oriented concepts, UML Diagrams, Structured design, Detailed design, Design review, Characteristics of a good user interface, User Guidance and Online Help, Mode-based Vs Mode-less Interface, Types of user interfaces, Component-based GUI development, User interface design methodology: GUI design methodology.

#### **Unit – IV : Coding and Testing**

Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.

#### **Unit – V: Software quality, reliability, and other issues**

Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. Basic issues in any reuse program, Reuse approach, Reuse at organization level.

#### **Text Book:**

1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018.
2. Pressman R, “Software Engineering- Practioner Approach”, McGraw Hill.

#### **Reference Books:**

1. Somerville, “Software Engineering”, Pearson 2.
2. Richard Fairley, “Software Engineering Concepts”, Tata McGraw Hill.
3. Jalote Pankaj, “An integrated approach to Software Engineering”, Narosa

## DESIGN AND ANALYSIS OF ALGORITHMS

### UNIT I

**Introduction:** Algorithm, Algorithm specification, Performance analysis. Divide and Conquer: General method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Selection, Strassen's matrix multiplication.

### UNIT II

**Greedy Method:** General method, Knapsack problem, Job Scheduling with Deadlines, Minimum cost Spanning Trees, Optimal storage on tapes, Single-source shortest paths. Dynamic programming: General Method, Multistage graphs, All-pairs 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, Bi-connected components and DFS Back tracking: General Method, 8 – queens problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles, Knapsack Problem.

### UNIT IV

**Branch and Bound:** The method, Travelling salesperson, 0/1 Knapsack problem, Efficiency considerations. Lower Bound Theory: Comparison trees, Lower bounds through reductions –

Multiplying triangular matrices, inverting a lower triangular matrix, computing the transitive closure.

## **UNIT V**

**NP – Hard and NP – Complete Problems:** NP Hardness, NP Completeness, Consequences of being in P, Cook’s Theorem, Reduction Source Problems, Reductions: Reductions for some known problems

### **Text Books**

1. Ellis Horowitz, SartajSahni and Rajasekaran, “Fundamentals of Computer Algorithms”, 2nd Edition, 2012, University Press.
2. ParagHimanshu Dave and HimanshuBhalchandra Dave, “Design and Analysis of Algorithms”, Second Edition, Pearson Education.

### **Reference Books**

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2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
4. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008.



# **RAYALASEEMA UNIVERSITY**

**Kurnool (A.P)-518007**

(A State University Established by the Govt. of A.P)

**DEPARTMENT OF COMPUTER SCIENCE**

## **MCA-II Semester Syllabus**

**COURSE STRUCTURE FOR MCA- II SEMESTER**

**Effective from Academic Year 2020- 2021 admitted batch**

### **MCA-I YEAR II-SEMESTER**

<b>Category</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Core Course - I	Object Oriented Programming using JAVA	3	0	0	3
Core Course - II	Python Programming	3	0	0	3
Core Course – III	Business English and soft skills	1	0	3	2.5
Core Course – IV	Machine Learning	3	0	0	3
Core Course – V	Software Engineering	3	0	0	3
Core Course-VI	Design and Analysis of Algorithms	3	0	0	3
Laboratory – I	Python Programming Lab	0	0	4	2
Laboratory – II	Software Engineering Lab	0	0	3	1.5
Laboratory – III	Object oriented Programming using JAVA Lab	0	0	3	1.5
	<b>Total Credits</b>	<b>16</b>	<b>0</b>	<b>13</b>	<b>22.5</b>

# Object Oriented Programming using JAVA

## UNIT-I:

**Object oriented thinking and Java Basics:** Need for oop paradigm, summary of oop concepts, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, using final with variables, garbage collection, overloading methods and constructors, recursion, nested and inner classes, exploring string class.

## UNIT-II:

**Inheritance:** Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance and methods, polymorphism- method overriding, abstract classes, the Object class. Packages: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages.

## UNIT-III:

**Interfaces:** Differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exception Handling: Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. String handling, Exploring java.util

## UNIT-IV:

**Event Handling:** Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. Handling menus, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag. Swing: Introduction, limitations of AWT, MVC architecture, components, containers, exploring swingJApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

## UNIT-V:

**Applets:** Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets. Multithreading: Differences between multi-threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter-thread communication, thread groups.

## TEXT BOOKS:

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2. Understanding OOP with Java, updated edition, T. Budd, Pearson edition.

**REFERENCE BOOKS:**

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.

2. An Introduction to OOP, T. Budd, 3rd edition, Pearson education.

3. Introduction to Java programming, Y. Daniel Liang, Pearson education.

4. An introduction to Java programming and object-oriented application development, R.A. JohnsonThomson.

5. Core Java 2, Vol 1, Fundamentals, Cay. S. Horstmann and Gary.

6. Cornell, 8th Edition, Pearson Education.

7. Core Java 2, Vol 2, Advanced Features, Cay. S. Horstmann and Gary Cornell, 8th Edition, Pearson Education.

8. Object Oriented Programming with Java, R. Buyya, S. T. Selvi, X. Chu, TMH.

9. Java and Object Orientation, an introduction, John Hunt, 2nd edition, Springer.

10. Maurach's Beginning Java2 JDK 5, SPD.

11. Programming and Problem Solving with Java, JM Slack, B S Publication

# PYTHON PROGRAMMING

## Unit – I

**Introduction:** What is a program, Running python, Arithmetic operators, Value and Types.  
**Variables, Assignments and Statements:** Assignment statements, Script mode, Order of operations, string operations, comments.

**Functions:** Function calls, Math functions, Composition, Adding new Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Variables and Parameters are local, Stack diagrams, Fruitful Functions and Void Functions, Why Functions.

## Unit – II

**Case study:** The turtle module, Simple Repetition, Encapsulation, Generalization, Interface design, Refactoring, docstring.

**Conditionals and Recursion:** floor division and modulus, Boolean expressions, Logical operators, Conditional execution, Alternative execution, Chained conditionals, Nested conditionals, Recursion, Infinite Recursion, Keyboard input.

**Fruitful Functions:** Return values, Incremental development, Composition, Boolean functions, More recursion, Leap of Faith, Checking types.

## Unit – III

**Iteration:** Reassignment, Updating variables, The while statement, Break, Square roots, Algorithms.

**Strings:** A string is a sequence, len, Traversal with a for loop, String slices, Strings are immutable, Searching, Looping and Counting, String methods, The in operator, String comparison.

**Case Study:** Reading word lists, Search, Looping with indices.

**Lists:** List is a sequence, Lists are mutable, Traversing a list, List operations, List slices, List methods, Map filter and reduce, Deleting elements, Lists and Strings, Objects and values, Aliasing, List arguments.

## Unit – IV

**Dictionaries:** A dictionary is a mapping, Dictionary as a collection of counters, Looping and dictionaries, Reverse Lookup, Dictionaries and lists, Memos, Global Variables.

**Tuples:** Tuples are immutable, Tuple Assignment, Tuple as Return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Sequences of sequences.

**Files:** Persistence, Reading and writing, Format operator, Filename and paths, Catching exceptions, Databases, Pickling, Pipes, Writing modules.

**Classes and Objects:** Programmer-defined types, Attributes, Instances as Return values, Objects are mutable, Copying. Classes and Functions:

### **Unit – V**

**Classes and Functions:** Time, Pure functions, Modifiers, Prototyping versus Planning

**Classes and Methods:** Object oriented features, Printing objects, The init method, The \_\_str\_\_ method, Operator overloading, Type-based Dispatch, Polymorphism, Interface and Implementation

**Inheritance:** Card objects, Class attributes, Comparing cards, decks, Printing the Deck, Add Remove shuffle and sort, Inheritance, Class diagrams, Data encapsulation.

**The Goodies:** Conditional expressions, List comprehensions, Generator expressions, any and all, Sets, Counters, defaultdict, Named tuples, Gathering keyword Args,

### **Text books:**

2. Allen B. Downey, “Think Python”, 2nd edition, SPD/O’Reilly, 2016.

### **Reference Books:**

1. Martin C.Brown, “The Complete Reference: Python”, McGraw-Hill, 2018.
2. Kenneth A. Lambert, B.L. Juneja, “Fundamentals of Python”, CENGAGE, 2015.
3. R. Nageswara Rao, “Core Python Programming”, 2nd edition, Dreamtech Press, 2019

## **Business English and soft skills**

### **UNIT I:**

Listening: Barriers of Listening skill-Approaches to Listening –How to improve Listening exercises. Speaking: Paralanguage: Sounds, stress, intonation- Art of conversation – Presentation skills – Public speaking- Expressing Techniques.

### **UNIT II:**

Reading: Kinds of Reading – Causes of reading difficulties – Reading strategies – exercises. Writing: Effective writing – Paragraph – Essay- Reports – Letters- Articles – Notices, Agenda & Minutes.

### **UNIT III:**

Communication: Modes of Communication- Barriers – Interpersonal skills – Negotiation skills – Non- Verbal communication - Etiquettes.

### **UNIT IV:**

Group Dynamic skills: Group Discussion – Team building & Team work – Be a manager or leader – Decision making – creativity – Time & Stress management skills.

### **UNIT V:**

Interview skills: Types of Interviews – Preparing for interview – Preparing a CV – Structuring the interview \_ Mock Interview \_ Quick Tips.

### **Text Books & Reference Books:**

1. Sanghi, Seema, Improve your communication skills. 2nd edition.
2. Burnard, Philip. Interpersonal skills Training: A source book of activities. 2005.
3. Ashley, Roderic. How to enhance your employability. 1998.
4. Dr. Alex, K. Soft skill: know yourself & Know the world. 2010.
5. Cornerstone. Developing softskills.4th edition 2005.
6. Jones, Daniel. An outline of English phonetics.
7. Aggarwal, Rohini. Business communication and Organization & Management.
8. Grath. E.H. Basic Managerial skills for all.
9. Maxwell, John C. Developing the leader within you

# MACHINE LEARNING

## Unit - I:

Introduction: Definition-Examples of machine learning applications –Well posed learning problems- Designing a learning system- Perspectives and issues Concept learning and general to specific ordering: Inductive learning hypothesis- Concept learning as search – candidate elimination algorithm-inductive bias.

## Unit - II:

Regression and classification - Regression: Linear Regression-Simple-Multiple Decision Tree-Pruning: Introduction –Representation-Algorithm issues Classification: Support Vector machine – Naïve Bayes-Applications.

## Unit - III:

Clustering and Learning - Clustering: k-Means clustering– adaptive Hierarchical clustering – Applications- Neural network : Perceptron, multilayer network- back propagation-introduction to deep neural network Instance based learning :k-NN– Radial basis functions Case based reasoning Reinforcement learning -Applications.

## Unit - IV:

Probabilistic graphical models- Graphical Models: Undirected graphical models - Markov Random Fields - Directed Graphical Models -Bayesian Networks - Conditional independence properties - Inference – Learning Generalization - Hidden Markov Models - Conditional random fields(CRFs).

## Unit - V:

Machine learning experiments - Design-Cross validation - Measuring Performance - Hypothesis testing- Assessing Performance -Comparison of algorithms, Datasets-Case study.

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## Reference Books:

1. P. Harrington, Machine learning in action, Manning Publications Co, 2012.
2. C. M. BishopPattern recognition and Machine Learning, Springer, 2007.
3. J.Bell, Machine Learning for Big Data, Wiley, 2014.

# **SOFTWARE ENGINEERING**

## **Unit – I: Basic concepts in software engineering and software project management**

Basic concepts: abstraction versus decomposition, evolution of software engineering techniques, Software development life cycle (SDLC) models: Iterative waterfall model, Prototype model, Evolutionary model, Spiral model, RAD model, Agile models, software project management: project planning, project estimation, COCOMO, Halstead's Software Science, project scheduling, staffing, Organization and team structure, risk management, configuration management.

## **Unit – II: Requirements analysis and specification**

The nature of software, The Unique nature of Webapps, Software Myths, Requirements gathering and analysis, software requirements specification, Traceability, Characteristics of a Good SRS Document, IEEE 830 guidelines, representing complex requirements using decision tables and decision trees, overview of formal system development techniques, axiomatic specification, algebraic specification.

## **Unit – III : Software Design**

Good Software Design, Cohesion and coupling, Control Hierarchy: Layering, Control Abstraction, Depth and width, Fan-out, Fan-in, Software design approaches, object oriented vs. function oriented design. Overview of SA/SD methodology, structured analysis, Data flow diagram, Extending DFD technique to real life systems, Basic Object oriented concepts, UML Diagrams, Structured design, Detailed design, Design review, Characteristics of a good user interface, User Guidance and Online Help, Mode-based Vs Mode-less Interface, Types of user interfaces, Component-based GUI development, User interface design methodology: GUI design methodology.

## **Unit – IV : Coding and Testing**

Coding standards and guidelines, code review, software documentation, Testing, Black Box Testing, White Box Testing, debugging, integration testing, Program Analysis Tools, system testing, performance testing, regression testing, Testing Object Oriented Programs.

## **Unit – V: Software quality, reliability, and other issues**

Software reliability, Statistical testing, Software quality and management, ISO 9000, SEI capability maturity model (CMM), Personal software process (PSP), Six sigma, Software quality metrics, CASE and its scope, CASE environment, CASE support in software life cycle, Characteristics of software maintenance, Software reverse engineering, Software maintenance processes model, Estimation maintenance cost. Basic issues in any reuse program, Reuse approach, Reuse at organization level.

## **Text Book:**

1. Rajib Mall, “Fundamentals of Software Engineering”, 5th Edition, PHI, 2018.
2. Pressman R, “Software Engineering- Practioner Approach”, McGraw Hill.

**Reference Books:**

4. Somerville, “Software Engineering”, Pearson 2.
5. Richard Fairley, “Software Engineering Concepts”, Tata McGraw Hill.
6. Jalote Pankaj, “An integrated approach to Software Engineering”, Narosa

## DESIGN AND ANALYSIS OF ALGORITHMS

### UNIT I

**Introduction:** Algorithm, Algorithm specification, Performance analysis. Divide and Conquer: General method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Selection, Strassen's matrix multiplication.

### UNIT II

**Greedy Method:** General method, Knapsack problem, Job Scheduling with Deadlines, Minimum cost Spanning Trees, Optimal storage on tapes, Single-source shortest paths. Dynamic programming: General Method, Multistage graphs, All-pairs 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, Bi-connected components and DFS Back tracking: General Method, 8 – queens problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles, Knapsack Problem.

### UNIT IV

**Branch and Bound:** The method, Travelling salesperson, 0/1 Knapsack problem, Efficiency considerations. Lower Bound Theory: Comparison trees, Lower bounds through reductions – Multiplying triangular matrices, inverting a lower triangular matrix, computing the transitive closure.

### UNIT V

**NP – Hard and NP – Complete Problems:** NP Hardness, NP Completeness, Consequences of being in P, Cook's Theorem, Reduction Source Problems, Reductions: Reductions for some known problems

### Text Books

1. Ellis Horowitz, SartajSahni and Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, 2012, University Press.
2. ParagHimanshu Dave and HimanshuBhalchandra Dave, "Design and Analysis of Algorithms", Second Edition, Pearson Education.

### Reference Books

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.



2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.
3. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
4. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.



# RAYALASEEMA UNIVERSITY

**Kurnool (A.P)-518007**

(A State University Established by the Govt. of A.P)

**DEPARTMENT OF COMPUTER SCIENCE**

## **MCA-III Semester Syllabus**

**COURSE STRUCTURE FOR MCA- III SEMESTER**  
**Effective from Academic Year 2020- 2021 admitted batch**

<b>Category</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Core Course - I	Cloud Computing	3	0	0	3
Core Course - II	Web Technologies	3	0	0	3
Core Course – III	Internet of Things	3	0	0	3
Core Course – IV	Computer Networks	3	0	0	3
Professional Elective - I	<b>Professional Elective I</b> <b><u>Artificial Intelligence</u></b> Foundations of Data Science Ad-hoc and Sensor Networks	4	0	0	4
Professional Elective - II	<b>Professional Elective II</b> <b><u>Cyber Security</u></b> Mobile Application Development Software Testing Methodologies	3	0	0	3
Laboratory – I	Cloud Computing Lab	0	0	3	1.5
Laboratory – II	Web Technologies Lab	0	0	3	2
Laboratory – III	Computer Networks lab			3	1.5
	<b>Total Credits</b>	<b>19</b>	<b>0</b>	<b>9</b>	<b>24</b>

## CLOUD COMPUTING

### Unit-1

**Introduction to cloud computing:** Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

**Cloud concepts and Technologies:** Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

### Unit-2

**Cloud Services and Platforms :** Compute Services, Storage Services, Database Services, Application services, Content delivery services, Analytics Services, Deployment and Management Services, Identity & and Access Management services, Open Source Private Cloud software.

**Cloud Application Design:** Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

### Unit-3

**Python for Cloud:** Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for Map Reduce, Python packages of Interest, Python web Application Frame work, Designing a RESTful web API.

**Cloud Application Development in Python:** Design Approaches, Image Processing APP, Document Storage App, Map Reduce App, Social Media Analytics App.

### Unit-4

**Multimedia Cloud:** Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Transcoding App.

**Cloud Application Benchmarking and Tuning:** Introduction, Workload Characteristics, Application Performance Metrics, Design Considerations for a Benchmarking Methodology, Benchmarking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop benchmarking case Study.

### Unit-5

**Cloud Security:** Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity & Access Management, Data Security, Key Management, Auditing.

**Cloud for Industry, Healthcare & Education:** Cloud Computing for Healthcare, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

**Migrating into a Cloud:** Introduction, Broad Approaches to migrating into the cloud, the seven –step model of migration into a cloud.

**Text Books:**

1. Cloud computing A hands-on Approach|| By ArshdeepBahga, Vijay Madiseti, Universities Press, 2016

2. Cloud Computing Principles and Paradigms: By Raj kumarBuyya, James Broberg, AndrzejGoscinski, wiley, 2016

**References:**

1. Mastering Cloud Computing by RajkumarBuyya, Christian Vecchiola, SThamaraiSelvi, TMH

2. Cloud computing A hands-On Approach by ArshdeepBahga and Vijay Madiseti.

3. Cloud Computing : A Practical Approach, Anthony T.Velte, Toby J.Velte, Robert Elsenpeter, TataMcGraw Hill, rp2011.

4. Enterprise Cloud Computing, GautamShroff, Cambridge University Press, 2010.

5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly, SPD, rp2011.

6. Essentials of Cloud Computing by K. Chandrasekaran. CRC Press

## **WEB TECHNOLOGIES**

### **UNIT-I:**

Introduction to PHP: Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads. Connecting to database (MySQL as reference), executing simple queries, handling results, Handling sessions and cookies File Handling in PHP: File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

### **UNIT-II:**

HTML Common Tags: List, Tables, images, forms, Frames; Cascading Style sheets; XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemes, Document Object Model, XHTML Parsing XML Data – DOM and SAX Parsers in java.

### **UNIT-III:**

Introduction to Servlets: Common Gateway Interface (CGI), Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions, connecting to a database using JDBC.

### **UNIT-IV:**

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking, connecting to database in JSP.

## **UNIT-V:**

Client-side Scripting: Introduction to Javascript, Javascript language – declaring variables, scope of variables, functions. event handlers (onclick, onsubmit etc.), Document Object Model, Form validation.

### **TEXT BOOKS:**

1. Web Technologies, Uttam K Roy, Oxford University Press
2. The Complete Reference PHP — Steven Holzner, Tata McGraw Hill

### **REFERENCE BOOKS:**

1. Web Programming, building internet applications, Chris Bates 2nd edition, Wiley Dreamtech
2. Java Server Pages —Hans Bergsten, SPD O'Reilly,
3. Java Script, D. Flanagan
4. Beginning Web Programming-Jon Duckett WROX.

## **INTERNET OF THINGS**

### **UNIT- I**

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

### **UNIT -II**

Embedded Devices: Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, Mobile phones and tablets, Plug Computing: Always-on Internet of Things

IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems ,ETSI M2M domains and High-level capabilities ,Communication Technologies

### **UNIT- III**

Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices.

Data Acquiring, Organizing and Analytics in IoT/M2M, , IOT/M2M Data Acquiring and Storage.

### **UNIT-IV**

Business Models for Business Processes in the Internet of Things, Applications/Services/Business Processes, Storage and Computing Using a Cloud Platform

for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Model

#### **UNIT-V**

IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

#### **TEXT BOOKS**

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A. Bahgya and V. Madiseti, Univesity Press, 2015

#### **REFERNCE BOOKS**

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things CunoPfister , Oreilly.

## **COMPUTER NETWORKS**

### **Unit – 1**

Computer Networks and the Internet What is the Internet?, The Network Edge, The Network Core, Delay, Loss, and Throughput in PacketSwitched Networks, Protocol Layers and their Service Models, Networks under attack, History of Computer Networking and the Internet

### **Unit – 2**

Application Layer Principles of Network Applications, The web and HTTP, File transfer: FTP, Electronic mail in the internet, DNS-The Internet's Directory Service, Peer-to-Peer Applications

### **Unit – 3**

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

### **Unit – 4**



The Network Layer Introduction, Virtual Circuit and Datagram Networks, The Internet Protocol(IP): Forwarding and Addressing in the Internet, Routing Algorithms, Routing in the Internet, Broadcast and Multicast Routing

### **Unit – 5**

The Layer: Links, Access Networks, and LANs Introduction to the Link Layer, Error-Detection and Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page Request

### **Text Books:**

1. James F. Kurose, Keith W. Ross, “Computer Networking: A Top-Down Approach”, 6th edition, Pearson, 2019.

### **References:**

1. Forouzan, Datacommunications and Networking, 5th Edition, McGraw Hill Publication.
2. Andrew S.Tanenbaum, David j.wetherall, Computer Networks, 5th Edition, PEARSON.
3. Youlu Zheng, Shakil Akthar, “Networks for Computer Scientists and Engineers”, Oxford Publishers, 2016.

## **ARTIFICIAL INTELLIGENCE**

### **(PROFESSIONAL ELECTIVE – I)**

#### **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, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment .

#### **UNIT-II:**

**Problem Solving by Search-II and Propositional Logic Adversarial Search:** Games, Optimal Decisions in Games, Alpha–Beta Pruning, Imperfect Real-Time Decisions.  
**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.

### **UNIT-III:**

**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.

**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 StateSpace Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

**Planning and Acting in the Real World:** Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

### **UNIT-V:**

**Uncertain knowledge and Learning Uncertainty:** Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

**Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

**Learning:** Forms of Learning, Supervised Learning, Learning Decision Trees.

### **TEXT BOOK:**

1. Artificial Intelligence A Modern Approach, Stuart Russell and Peter Norvig, 3rd Edition, Pearson Education.

**REFERENCE BOOKS:**

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

**FOUNDATIONS OF DATA SCIENCE**

**(PROFESSIONAL ELECTIVE – I)**

**UNIT-I**

Introduction to Probability and Statistics: Descriptive Statistics: Measures of central tendency—mean, median, mode, harmonic mean and geometric mean; Measures of

dispersion – mean deviation from mean, standard deviation and variance. Central moments. Linear and rank correlation. Covariance and correlation; Statistics and sampling distributions; Hypothesis testing of means, proportions, variances and correlations Definition of random variable and probability, (problems depending on counting –taught in MFCS), discrete probability distributions: Bernoulli, Binomial, Poisson; Continuous probability distributions: Gaussian, Exponential, Chi-square. Definition of Bayesian probability. Probability theory and axioms; Random variables; Probability distributions and density functions (univariate and multivariate); Expectations and moments;; Confidence (statistical) intervals; Correlation functions; White-noise process. Probability, Hypothesis and Inference, Gradient Descent.

## **UNIT-II**

Exploratory Data Analysis (EDA), Data Science life cycle, Descriptive Statistics, Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA.

Data Visualization: Scatter plot, bar chart, histogram, boxplot, heat maps etc.

## **UNIT-III**

Introduction to Pattern Recognition and Machine Learning Patterns, features, pattern representation, curse of dimensionality, dimensionality reduction. Supervised and Unsupervised learning. Classification—linear and non-linear. Bayesian, Perceptron, Nearest neighbor classifier, Support vector machine, use of kernels, Logistic regression, Naïve-bayes, decision trees and random forests; boosting and bagging. Clustering---partitional and hierarchical; k-means clustering. Regression. Least squares. Evaluation metrics: RMSE, MAE and Coefficient of Determination (Rsquare) Cost functions, training and testing a classifier. Cross-validation. Class-imbalance – ways of handling, Exploratory data analysis (EDA), evaluation metrics— Precision, Recall, RoC, AUC; Confusion matrix, Classification accuracy

## **UNIT-IV**

Introduction to Deep Learning Multilayer perceptron. Back propagation. Loss functions. Epochs and Batch sizes. Hyper parameter tuning. Applications to classification, regression and unsupervised learning. Overview (introduction to the terms) of RNN, CNN and LSTM.

## **UNIT-V**

Overview of Data Science Models. Applications to text, images, videos: recommender systems, image classification, Social network graphs

### **Textbooks:**

1. Cathy O’Neil, Rachel Schutt, Doing Data Science, Straight Talk from the Frontline. O’Reilly, 2013.
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

3. Ian Goodfellow, YoshuaBengio, Aaron Courville, Deep Learning, MIT Press, 2016
4. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009.
5. Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons,2011.

**References:**

1. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.
2. Francois Chollet, Deep Learning with Python, 1/e, Manning Publications Company, 2017
3. [UNIT-1] Robert V Hogg, Allen Craig and J.W. McKean. Introduction to Mathematical Statistics. Pearson. (Indian Edition)
4. [UNIT-II] EMC2: 4) Data Science and Big Data Analytics, EMC Education Services, EMC 2 , Wiley Publication, 2015.
5. [UNIT-III] V. Susheela Devi and M. NarasimhaMurty. Pattern Recognition – An Introduction. Universities Press (Indian Edition; there is an expensive Springer version of the same)
6. [UNIT-II] Christopher M. Bishop. Pattern Recognition and Machine Learning. Springer (Indian Edition)
7. [UNIT-III]Ian Goodfellow and YoshuaBengio and Aaron Courville. Deep Learning. MIT Press. Book available online at <https://www.deeplearningbook.org/>.
8. [UNIT-IV] J. Leskovec, A. Rajaraman, J.D. Ullman. Mining of Massive Datasets. Cambridge University Press. (Indian Edition; Online pdf is available for download)

## **(PROFESSIONAL ELECTIVE – I)**

### **UNIT-I**

Introduction to Ad Hoc Networks: Characteristics of MANETs, Applications of MANETs and Challenges of MANETs. Routing in MANETs - Criteria for classification, Taxonomy of MANET routing algorithms, Topologybased routing algorithms-Proactive: DSDV; Reactive: DSR, AODV; Hybrid: ZRP; Position-based routing algorithms-Location Services-DREAM, Quorum-based; Forwarding Strategies: Greedy Packet, Restricted Directional Flooding-DREAM, LAR.

### **UNIT-II**

Data Transmission: Broadcast Storm Problem, Rebroadcasting Schemes-Simple-flooding, Probability-based Methods, Area-based Methods Neighbor Knowledge-Based: SBA, Multipoint Relaying, AHBP. Multicasting: Tree-based: AMRIS, MAODV; Mesh-based: ODMRP, CAMP; Hybrid: AMRoute, MCEDAR.

### **UNIT-III**

Geocasting: Data-transmission Oriented-LBM; Route Creation Oriented-GeoTORA, MGR. TCP over Ad Hoc TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc UNIT-IV: Basics of Wireless: Sensors and Lower Layer Issues, Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer, Routing Layer.

### **UNIT-V**

Upper Layer Issues of WSN: Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots.

### **TEXT BOOK**

1. Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006, ISBN – 981–256–681–3.

### **REFERENCE BOOK**

1. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN – 978-1-55860-914-3 (Morgan Kauffman).

## CYBER SECURITY

### (PROFESSIONAL ELECTIVE – II)

#### UNIT-I

**Introduction:** Cyber attacks, Defense Strategies and Techniques

**Mathematical background for Cryptography:** Modulo arithmetic, The greatest common divisor, Useful Algebraic Structures, Chinese Remainder Theorem

**Basics of Cryptography:** Secret versus Public key Cryptography, Types of attacks, Elementary substitution Ciphers, Elementary Transposition Ciphers, Other Cipher Properties

**Secret Key Cryptography:** Product Ciphers, DES Construction, Modes of Operation, MAC and other Applications, Attacks, Linear Crypt analysis.

#### UNIT-II

**Public Key Cryptography:** RSA Operations, Performance, Applications, Practical Issues

**Cryptographic Hash:** Properties, Construction, Applications and Performance

**Discrete Logarithm and its applications:** Diffie-Hellman Parameters, Other applications

**Elliptic Curve Cryptography and Advanced Encryption Standard:** Elliptic Curve Cryptography, Applications, Practical Considerations, Advanced Encryption Standard (AES).

#### UNIT-III

**Key Management:** Digital Certificates, Public key Infrastructure, Identity based Encryption,

**Authentication-I:** One-way Authentication, Mutual Authentication, Dictionary attacks,

**Authentication-II:** Centralized Authentication, The Needham-Schroeder Protocol, Kerberos, Biometrics

**Security at the Network Layer:** Security at Different Layers: Pros and Cons, IP Sec, Internet Key Exchange(IKE) protocol, Security policy and IPSec, Virtual Private Networks

**Security at the Transport Layer:** Introduction, SSL Handshake Protocol, SSL Record Layer Protocol, Open SSL.

#### UNIT-IV

**Software Vulnerabilities:** Phishing, Buffer Overflow, Format string attacks, Cross-site Scripting(XSS), SQL Injection, Virus and Worm Features, Internet scanning Worms, Topological Worms, Botnets

**Access Control in the Operating System:** Preliminaries, Mandatory Access Control, Role-based Access control

**Firewalls:** Basics, Practical issues

**Intrusion Prevention and Detection:** Prevention Versus Detection, Types of Intrusion detection systems, DDoS attack prevention/detection, Malware Defense.

## **UNIT-V**

**WLAN Security:** IEEE 802.11 WirelessLAN Security:Background, Authentication, Confidentiality and Integrity

**Cell phone Security:** Preliminaries, GSM (2G) Security, Security in UMTS (3G)

**RFIDs and E-Passports:** RFID basics, Applications, Security issues, Addressing RFID Privacy Concerns, Electronic Passports

**Electronic Payment:** Introduction, Enabling Technologies, Cardholder Present E-Transactions, Payment over the Internet, Mobile Payments, Electronic cash

## **TEXT BOOKS:**

1. Network security and Cryptography by Bernard Menezes CENGAGE Learning Publications, 2010.

## **REFERENCES:**

1. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, New Delhi, 2006.
2. Jonathan Katz, Yehuda Lindell, “Introduction to Modern Cryptography”, Chapman & Hall/CRC, New York, 2007.
3. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons, New York, 2004.



4. Charlie Kafuman, Radia Perlman, Mike Spenciner, Network Security Private Communication in Private world, Second Edition, Prentice Hall India 2002,ISBN:81-203-2213-4

## **SOFTWARE TESTING METHODOLOGIES**

### **(PROFESSIONAL ELECTIVE – II)**

#### **UNIT-I:**

Introduction: Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

#### **UNIT-II:**

Transaction Flow Testing: transaction flows, transaction flow testing techniques. Dataflow testing: Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing. Domain Testing: domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

#### **UNIT-III:**

Paths, Path products and Regular expressions: path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing: Overview, decision tables, path expressions, kv charts, specifications.

#### **UNIT-IV:**

State, State Graphs and Transition testing: state graphs, good & bad state graphs, state testing, Testability tips.

#### **UNIT-V:**

Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

#### **TEXT BOOKS:**

1. Software Testing techniques - Baris Beizer, 2nd edition, Dreamtech.
2. Software Testing Tools – Dr. K. V. K. K. Prasad, Dreamtech.

**REFERENCE BOOKS:**

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille).
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley

## **MOBILE APPLICATION DEVELOPMENT**

### **(PROFESSIONAL ELECTIVE – II)**

#### **Unit- I**

**Fundamentals of java for android application development:** introduction to java, working with java tokens, knowledge check-1, explaining data types, declaring variables, declaring classes, declaring methods, creating objects, interfaces, inheritance, implementing flow control statements.

**Getting an overview of android:** Introducing android, discussing about android applications, the manifest file, downloading and installing android, exploring the development environment, developing and executing the first android application

#### **Unit- II**

**Using Activities, Fragments, and Intents in Android:** Working with activities, using intents, fragments, using the intent objects to invoke built-in Application.

**Working with the user interface using views and ViewGroup:** Working with view groups, binding data with the AdapterView class, designing the AutoTextCompleteView, implementing screen orientation, designing the views programmatically, handling UI events, specialized fragments, creating menus.

#### **Unit- III**

**Handling pictures and menus with views:** Working with image views, designing context menu for image view, using the AnalogClock and digitalclock, embedding web browser in an activity, notifying the user.

**Storing the data persistently:** introducing the data storage options, using the internal storage, using the external storage, using the SQLite database, working with content providers.

**Emailing and Networking with android:** building an application to send email, networking in android, checking network availability, consuming JSON services, socket programming.

#### **Unit- IV**

**Working with location services and maps:** working with google maps, working with geocoding and reverse geocoding.

**Working with graphics and animation:** Working with graphics, using the drawable object, using the ShapeDrawable object, working with the NinePatchDrawable graphics, understanding the concept of hardware acceleration, working with animation.

#### **Unit- V**

**Audio, Video, and Camera:** Role of media playback, using media player, recording and playing sound, creating a sound pool, using camera for taking pictures, recording video.

**Bluetooth, NFC, and Wi-Fi:** Working with Bluetooth creating an application using Bluetooth functionality, connecting the devices using Bluetooth for data transfer, working with Bluetooth low energy, working with NFC, working with Wi-Fi.

**Telephony and SMS:** handling telephony, handling SMS, sending SMS Using SmsManager.

#### **Text Book:**

1. Pradeep Kothari, “Android Application Development(with KitKat Support)”, dreamtech press.

#### **Reference Book:**

1. Reto Meier, “Professional Android 4 Application Development”, John Wiley & Sons, Inc.
2. Wei-Meng Lee, “Beginning Android 4 Application Development”, Wiley India.



# RAYALASEEMA UNIVERSITY

**Kurnool (A.P)-518007**

(A State University Established by the Govt. of A.P)

**DEPARTMENT OF COMPUTER SCIENCE**

## **MCA-IV Semester Syllabus**

**COURSE STRUCTURE FOR MCA- IV SEMESTER**

**Effective from Academic Year 2020- 2021 admitted batch**

<b>Category</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Credits</b>
Professional Elective - III	<b>Professional Elective III</b> Agile and Devops Design Patterns Ad-hoc and Sensor Networks	3	0	0	3
Professional Elective - IV	<b>Professional Elective IV</b> e-Commerce Cyber Laws and Privacy Entrepreneurship	3	0	0	3
Seminar	Technical Seminar	0	0	4	2
Project	Project work	0	0	20	10
	<b>Total Credits</b>	<b>6</b>	<b>0</b>	<b>24</b>	<b>18</b>

**AGILE and DEVOPS**  
**(Professional Elective III)**

**Course Objectives:**

- To give strong knowledge of Agile practices
- To give strong foundation of applications of DevOps
- To give strong foundation of development and its operations
- To give strong foundation of the source code management

**Unit -I**

Why Agile?, How to be Agile, Understanding XP, Values and Principles, Improve the Process, Eliminate Waste, Deliver Value.

**Unit- II**

Practicing XP-Thinking, Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand-Up Meetings, Coding Standards, Iteration Demo, Reporting.

**Learning Outcomes:**

At the end of the unit, students will be able to:

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.

**Unit- III**

Releasing-Done Done, No Bugs, Version Control, Ten-Minute Build, Continuous Integration, Collective Code Ownership, Documentation.

**Learning Outcomes:**

At the end of the unit, students will be able to:

- Develop techniques and tools for improving team collaboration and software quality.
- Perform Software process improvement as an ongoing task for development teams.
- Able to demonstration of agile practices.

#### **Unit -IV**

DEFINITION & PURPOSE OF DEVOPS: Introduction to DevOps - DevOps and Agile, Minimum Viable Product - Application Deployment - Continuous Integration - Continuous Delivery

#### **Learning Outcomes:**

- At the end of the unit, students will be able to:
- Understand the basics of Dev Ops
- Able to develop an application and its deployment
- Know the purpose of continuous integration and continuous delivery

#### **Unit -V**

CAMS (CULTURE, AUTOMATION, MEASUREMENT AND SHARING): CAMS – Culture - CAMS – Automation - CAMS – Measurement - CAMS – Sharing - Test-Driven Development - Configuration Management - Infrastructure Automation - Root Cause Analysis – Blamelessness - Organizational Learning.

#### **Learning Outcomes:**

At the end of the unit, students will be able to:

- Understand the basics and need of Culture, Automation, Measurement and Sharing
- Understand the test-driven development
- Know the purpose of configuration management
- Know the purpose of organizational learning.

#### **Course Outcomes:**

On completion of this course, the students will be able to

- Understand the traditional software development.

- Learn the rise of agile methodologies.
- Define and design purpose of DevOps
- Understand applied DevOps.
- Learn real world applications of DevOps.
- Understand its practical examples.

**Text Books:**

1. James Shore and Shane Warden, “The Art of Agile Development”, O’REILLY, 2007.
2. Robert C. Martin, “Agile Software Development, Principles, Patterns, and Practices” , PHI, 2002.
3. The DevOps Handbook - by Gene Kim, Jez Humble, Patrick Debois, and Willis Willis
4. What is DevOps? - by Mike Loukides
5. The DevOps Handbook - by John Willis, Patrick Debois, Jez Humble, Gene Kim.
6. DevOps: A Software Architect’s Perspective - by Len Bass, Ingo Weber, Liming Zhu.

**References:**

1. Angel Medinilla, “Agile Management: Leadership in an Agile Environment”, Springer, 2012.
2. Bhuvan Unhelkar, “The Art of Agile Practice: A Composite Approach for Projects and Organizations”, CRC Press.
3. Jim Highsmith, “Agile Project Management”, Pearson education, 2004.



## **DESIGN PATTERNS**

### **(Professional Elective III)**

#### **UNIT - I**

Introduction: What is a design pattern? design patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.

#### **UNIT - II**

Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary

#### **UNIT - III**

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

#### **UNIT - IV**

Structural Pattern: Adapter, Bridge, Composite, Decorator, Façade, Flyweight, Proxy

#### **UNIT - V**

Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Strategy, Template Method, Visitor.

#### **TEXT BOOK:**

1. Design Patterns, Erich Gamma, Pearson Education

**REFERENCE BOOKS:**

1. Pattern's in Java, Vol –I, Mark Grand, Wiley Dream Tech.
2. Patterns in Java, Vol-II, Mark Grand, Wiley Dream Tech.
3. Java Enterprise Design Patterns Vol-III, Mark Grand, Wiley Dream Tech.
4. Head First Design Patterns, Eric Freeman, O'reily publications

## **E – COMMERCE**

### **(Professional Elective IV)**

#### **UNIT - I**

Electronic Commerce:-Frame work, Anatomy of E-Commerce applications, E-Commerce Consumer Applications, E-Commerce Organization Applications, Consumer Oriented Electronic Commerce: - Consumer Oriented Applications, Mercantile Process models.

#### **UNIT - II**

Electronic Payment Systems: - Types of Electronic Payment System, Digital Token-Based, Smart Cards, Credit Cards, Risks and Electronic Payment Systems.

#### **UNIT - III**

Inter Organizational Commerce and EDI:- Electronic Data Interchange, EDI in Application Business, EDI: Legal, Security and Privacy Issues, EDI and Electronic Commerce. EDI

Implementation, MIME and Value Added Networks:- Standardization and EDI, EDI Software Implementation, EDI Envelope for Message Transport, Value added networks, Internet Based EDI.

#### **UNIT - IV**

Corporate Digital Library – Dimensions of Internal EC Systems, Making a Business Case for a Document Library, Types of Digital Document, Issues behind Document Infrastructure, Corporate Data Warehouses. Advertising and Marketing - Information Based Marketing, Advertising on Internet, On-line Marketing Process, Market Research.

#### **UNIT - V**

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering. Multimedia - Key Multimedia Concepts, Digital Video and Electronic Commerce, Desktop Video Processing's, Desktop Video Conferencing.

#### **Text Book:**

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson, 1996.

#### **References:**

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal – Galgotia.

### **CYBER LAWS AND PRIVACY**

#### **(Professional Elective IV)**

#### **UNIT-I**

Introduction to cyber space: UNCITRAL Model Law - Information Technology Act, 2000 with recent amendments - Jurisdictional issues - Digital signatures - regulation of - certifying authorities - Cyber Regulation Appellate Tribunal

#### **UNIT-II**

Online Contracts: Formation of online contracts - E banking transactions, online payment options, online advertising - Electronic and digital signatures - Taxation issues in cyber

space- indirect tax, tax evasion, double tax, international tax, permanent establishment -  
Protection of trade secrets and deceptive trade practices

### **UNIT-III**

Cyber Crimes: Understanding cybercrimes - actus reus and mens rea - Types of crimes in the internet against person, against property, against government - Digital evidence- investigation and adjudication of cybercrimes in India- cyber arbitration, cyber conflict investigation

### **UNIT-IV**

Intellectual Property Rights (IPR) and Cyber Space: Copyright issues in the internet- protection of computer software, caching, international regime-OSS, DMCA, Data Protection Directive - Trademark issues in the internet – Domain Name Registration, Domain Name Registration, Domain Name Dispute, ICANN, UDRP policy, linking, framing, tagging - Database issues in the internet

### **UNIT-V**

Concept of Privacy: Historical and Cultural Perspectives, Meaning and Scope of Privacy, Critiques of Privacy, Right to Privacy – Louis Brandeis and Samuel Warren, Modern Principles of Privacy Law, Legal Regimes for Protecting Privacy, Privacy as a Legal Right, Privacy – The Human Rights Angle, Threats to Privacy in New Technological Regime, Digital and Internet Privacy Challenges.

### **TEXTBOOKS:**

1. Computers, Technology and the new internet laws – Karnika Seth.
2. Legal dimensions of cyber space – S. K. Verma.
3. Cyber law – Nandan Kamath.
4. Intellectual property and the Internet – Rodney Ryder.

### **REFERENCES:**

1. Information technology law – Ian. J. Lyod.
2. Cyber space law commentaries and Materials- Yee fen Lim.
3. Cyber law – Yatindra Sinha.

## **ENTREPRENEURSHIP**

**(Professional Elective IV)**

### **UNIT-I**

Entrepreneurial Perspectives: Introduction to Entrepreneurship – Evolution - Concept of Entrepreneurship - Types of Entrepreneurs - Entrepreneurial Competencies, Capacity

Building for Entrepreneurs. Entrepreneurial Training Methods - Entrepreneurial Motivations - Models for Entrepreneurial Development - The process of Entrepreneurial Development.

## **UNIT-II**

New Venture Creation: Introduction, Mobility of Entrepreneurs, Models for Opportunity Evaluation; Business plans – Purpose, Contents, Presenting Business Plan, Procedure for setting up Enterprises, Central level - Startup and State level - T Hub, Other Institutions initiatives.

## **UNIT-III**

Management of MSMEs and Sick Enterprises: Challenges of MSMEs, Preventing Sickness in Enterprises – Specific Management Problems; Industrial Sickness; Industrial Sickness in India – Symptoms, process and Rehabilitation of Sick Units.

## **UNIT-IV**

Managing Marketing and Growth of Enterprises: Essential Marketing Mix of Services, Key Success Factors in Service Marketing, Cost and Pricing, Branding, New Techniques in Marketing, International Trade.

## **UNIT-V**

Strategic perspectives in Entrepreneurship: Strategic Growth in Entrepreneurship, The Valuation Challenge in Entrepreneurship, The Final Harvest of New Ventures, Technology, Business Incubation, India way – Entrepreneurship; Women Entrepreneurs – Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India.

### **TEXT BOOKS:**

1. Entrepreneurship Development and Small Business Enterprises, Poornima M. Charantimath, 2nd edition, Pearson, 2014.
2. Entrepreneurship, a South – Asian Perspective, D. F. Kuratko and T. V. Rao, 3rd edition, Cengage, 2012.

### **REFERENCE BOOKS:**

1. Entrepreneurship, Arya Kumar, 4th edition, Pearson 2015.

2. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2015.



