



**P.B. SIDDHARTHA COLLEGE OF ARTS & SCIENCE**  
Siddhartha Nagar, Vijayawada – 520 010  
*Autonomous - Re-accredited at 'A+' by the NAAC - ISO 9001 - 2015 Certified*  
*College with Potential for Excellence-Phase-II (Awarded by the UGC)*

**2.6.2 Attainment of Programme Outcomes and Course Outcomes as evaluated by the institution**

**COs, POs for Attainment**

**(Exampler – M.Sc. Computer Science & MCA)**

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**Attainment of Programme Outcomes and Course Outcomes as Evaluated by the Institution for M.Sc.(Computer Science) Programme, 2021-2022**

Course Code	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
<b>FIRST SEMESTER</b>								
20CS1T1	CO1		M	H				
	CO2	L			M			
	CO3		M			L		
	CO4				H			
	CO5						H	
20CS1T2	CO1			M	H			
	CO2					L		
	CO3			M		L		H
	CO4		L		M		H	
	CO5		L	H				
20CS1T3	CO1		M					
	CO2			H				
	CO3		M					
	CO4			H				
	CO5				H			
20CS1T4	CO1			L	M			
	CO2	M			L			
	CO3		L		H			
	CO4			H				
	CO5	H						
20CS1T5	CO1		M					
	CO2				M			
	CO3				H			
	CO4				H			
	CO5			H				
20CS1L1	CO1	H						
	CO2		M					
	CO3				M			
	CO4				M			
	CO5				L			
20CS1L1	CO1		L					M
	CO2			M				H
	CO3				M			
	CO4					L		

20CS1S1	CO1						M	H
	CO2	M						
	CO3							H
	CO4							M
	CO5	L						
SECOND SEMESTER								
20CS2T1	CO1			M	M			
	CO2				H			
	CO3				M			
	CO4				M			
	CO5			L				
20CS2T2	CO1		H					H
	CO2		L					M
	CO3		M					
	CO4	M	M					
	CO5						H	M
20CS2T3	CO1		M					
	CO2				H			
	CO3		H					
	CO4				H			
	CO5			M				
20CS2T4	CO1		L					M
	CO2		M					
	CO3	M						M
	CO4	L						H
	CO5	H						H
20OE02	CO1			L	M			H
	CO2			M				
	CO3		M					H
	CO4	M			M			
	CO5	M						
20CS2L1	CO1	L	M					
	CO2		M				H	
	CO3			M	M			
	CO4		H		M			
	CO5				M	L		
20CS2L2	CO1	M			L			
	CO2				M			
	CO3	M						

	CO4				M			
	CO5	H						M
20CS2TRW	CO1							M
	CO2							L
	CO3							M
	CO4							L
	CO5		H	M				M

THIRD SEMESTER								
20CS3T1	CO1	L	M					
	CO2		L		H			
	CO3			M	L			
	CO4			M	M			
	CO5		M					H
20CS3T2	CO1				H			
	CO2		M					
	CO3			H				
	CO4		M					
	CO5	H						M
20CS3T3	CO1	H		M				
	CO2	H			M			
	CO3				M			
	CO4		L					
	CO5	M						
20CS3T4	CO1		M					
	CO2				H	L		
	CO3				M			
	CO4		L			L		
	CO5	M					M	
20EN3E2	CO1	M						
	CO2				H			
	CO3			M				
	CO4				M			
	CO5				H			
20CS3L1	CO1	H						
	CO2		M					
	CO3		M					
	CO4			M				
	CO5				L			
20CS3L2	CO1	M						

	CO2		L					
	CO3		M					
	CO4			M				
	CO5			M	M			

FOURTH SEMESTER								
20CS4M1	CO1	L		L				
	CO2				M			H
	CO3	M	M					
	CO4				L			
	CO5		L	M				
20CS4T1	CO1	L		L				
	CO2				M			M
	CO3			L				
	CO4			M	M			
	CO5				M			M
20CS4T3	CO1	L	M	L				
	CO2	M	L		L			
	CO3	M						M
	CO4	L						H
	CO5	L						M
20CS4T4	CO1	L	M	L				
	CO2	H	H		L			
	CO3	M						M
	CO4	L						H
	CO5	L						M
20CS4P1	CO1	H						H
	CO2					L		M
	CO3					L		L
	CO4						H	H
	CO5						M	M

	H	10	4	7	15	0	6	15
	M	16	24	16	27	0	3	18
	L	14	12	9	8	10	0	3
<b>Total weightage of the course</b>		<b>152</b>	<b>120</b>	<b>120</b>	<b>224</b>	<b>10</b>	<b>63</b>	<b>192</b>
20CS1T1	C.Weightage	0.66	5.00	7.50	5.36	10.00	14.29	0.00
20CS1T2	C.Weightage	0.00	1.67	12.50	5.36	20.00	14.29	4.69
20CS1T3	C.Weightage	0.00	5.00	15.00	4.02	0.00	0.00	0.00
20CS1T4	C.Weightage	7.89	0.83	8.33	5.80	0.00	0.00	0.00
20CS1T5	C.Weightage	0.00	2.50	7.50	9.38	0.00	0.00	0.00
20CS1L1	C.Weightage	5.92	2.50	0.00	3.13	0.00	0.00	0.00
20CS1L2	C.Weightage	0.00	0.83	2.50	1.34	10.00	0.00	6.25
20CS1S1	C.Weightage	2.63	0.00	0.00	0.00	0.00	4.76	10.94
20CS2T1	C.Weightage	0.00	0.00	3.33	8.04	0.00	0.00	0.00
20CS2T2	C.Weightage	1.97	13.33	0.00	0.00	0.00	14.29	7.81
20CS2T3	C.Weightage	0.00	10.00	2.50	8.04	0.00	0.00	0.00
20CS2T4	C.Weightage	8.55	3.33	0.00	0.00	0.00	0.00	12.50
20OE02	C.Weightage	3.95	2.50	3.33	2.68	0.00	0.00	9.38
20CS2L1	C.Weightage	0.66	12.50	2.50	4.02	10.00	14.29	0.00
20CS2L3	C.Weightage	9.87	0.00	0.00	3.13	0.00	0.00	1.56
20CS2TRW	C.Weightage	0.00	0.00	0.00	0.00	0.00	0.00	4.17
20CS3T1	C.Weightage	0.66	5.83	5.00	5.80	0.00	0.00	4.69
20CS3T2	C.Weightage	5.92	5.00	7.50	4.02	0.00	0.00	1.56
20CS3T3	C.Weightage	13.82	0.83	2.50	2.68	0.00	0.00	0.00
20CS3T4	C.Weightage	1.97	3.33	0.00	5.36	20.00	4.76	0.00
20EN3E2	C.Weightage	1.97	0.00	2.50	9.32	0.00	0.00	0.00
20CS3L1	C.Weightage	5.92	5.00	2.50	0.45	0.00	0.00	0.00
20CS3L2	C.Weightage	1.97	3.33	5.00	1.34	0.00	0.00	0.00
20CS4M1	C.Weightage	0.66	0.00	0.83	4.02	10.00	14.29	0.00
20CS4T1	C.Weightage	2.63	3.33	3.33	1.79	0.00	0.00	4.69
20CS4T3	C.Weightage	0.66	0.00	4.17	4.02	0.00	0.00	3.13
20CS4T4	C.Weightage	5.92	3.36	0.83	0.45	0.00	0.00	7.81
20CS4L1	C.Weightage	9.87	10.00	0.85	0.45	0.00	0.00	7.80
20CS4P1	C.Weightage	5.93	0.00	0.00	0.00	20.00	19.03	13.02
		100.00	100.00	100.00	100.00	100.00	100.00	100.00

## CO ATTAINMENT

S.NO	COURSE	Heads of Passing (% attainment) Direct			Indirect (I)	Average course Attainment
		IA TEST(30M)	SEM END EXAM(70M)	Average % Attainment(D)		
1	Problem Solving Using Python Programming	83.72	51.16	60.93	86.05	68.46
2	Computer Organization	51.16	25.58	33.25	88.37	49.79
3	Software Engineering	93.02	67.44	75.11	88.37	79.09
4	Database Management Systems	56.90	37.20	43.11	88.37	56.69
5	Theory of Computation	74.41	46.51	54.88	86.05	64.23
6	Problem Solving Using Python Programming Lab	100.00	100.00	100.00	86.05	95.82
7	DBMS Lab	100.00	100.00	100.00	88.37	96.51
8	Seminar	100.00	100.00	100.00	86.05	95.82
9	Computer Networks	56.09	60.97	59.51	85.37	67.27
10	Data Structures	100	51.21	65.85	95.12	74.63
11	Web Technologies	100.00	19.51	43.66	95.12	59.10
12	Operating Systems	100.00	19.51	43.66	92.68	58.36
13	Mobile Application Development	100.00	31.70	52.19	92.68	64.34
14	Computer Networks & Operating Systems Lab	100.00	100.00	100.00	85.37	95.61
15	Data Structures Lab	100	100	100.00	85.37	95.61
16	Technical Report Writing	100.00	100.00	100.00	81.25	94.38
17	Internet of Things	100.00	63.41	74.39	95.12	80.61
18	Cryptography & Network Security	70.73	19.50	34.87	96.50	53.36
19	Design and Analysis of Algorithms	100.00	58.53	70.97	98.33	79.18
20	Data Mining Techniques	92.68	53.65	65.36	93.68	73.86
21	English Presentation and Soft Skills	92.68	63.41	72.19	94.68	78.94
22	Web Technologies Lab	100	100	100.00	95.68	98.70
23	Data Mining Lab	100	100	100.00	96.68	99.00
25	MOOCS	90.24	75.6	79.99	91.28	83.38
26	Big Data and Analytics	95.12	65.85	74.63	91.05	79.56
27	Artificial Intelligence & Machine Learning	97.56	87.8	90.73	90	90.51
28	Cloud Computing	95.3	89.2	91.4	92	91.5
28	Bigdata And Anlytics Lab	100	100	100.00	91.05	97.32
29	Project Work	100	100	100.00	74.05	92.22

Weighted Contribution of the course in attainment of POs						
PO1	PO2	PO3	PO4	PO5	PO6	PO7
0.45	3.42	5.13	3.67	6.85	9.78	0.00
0.00	0.83	6.22	2.67	9.96	7.11	2.33
0.00	3.95	11.86	3.18	0.00	0.00	0.00
4.48	0.47	4.72	3.29	0.00	0.00	0.00
0.00	1.61	4.82	6.02	0.00	0.00	0.00
5.67	2.40	0.00	2.99	0.00	0.00	0.00
0.00	0.80	2.41	1.29	9.65	0.00	6.03
2.52	0.00	0.00	0.00	0.00	4.56	10.48
0.00	0.00	2.24	5.41	0.00	0.00	0.00
1.47	9.95	0.00	0.00	0.00	10.66	5.83
0.00	5.91	1.48	4.75	0.00	0.00	0.00
4.99	1.95	0.00	0.00	0.00	0.00	7.30
2.54	1.61	2.14	1.72	0.00	0.00	6.03
0.63	11.95	2.39	3.84	9.56	13.66	0.00
9.44	0.00	0.00	2.99	0.00	0.00	1.49
0.00	0.00	0.00	0.00	0.00	0.00	3.93
0.53	4.70	4.03	4.68	0.00	0.00	3.78
3.16	2.67	4.00	2.14	0.00	0.00	0.83
10.94	0.66	1.98	2.12	0.00	0.00	0.00
1.46	2.46	0.00	3.96	14.77	3.52	0.00
1.56	0.00	1.97	7.40	0.00	0.00	0.00
5.84	4.94	2.47	0.44	0.00	0.00	0.00
1.95	3.30	4.95	1.33	0.00	0.00	0.00
0.65	0.00	0.83	3.99	9.93	14.19	0.00
2.19	2.78	2.78	1.49	0.00	0.00	3.91
0.52	0.00	3.31	3.20	0.00	0.00	2.49
5.36	3.02	0.75	0.40	0.00	0.00	7.07
9.60	9.73	0.81	0.43	0.00	0.00	7.60
5.46	0.00	0.00	0.00	18.44	17.56	12.01
<b>81.43</b>	<b>79.11</b>	<b>71.32</b>	<b>73.40</b>	<b>79.16</b>	<b>81.04</b>	<b>81.12</b>



Final PO Attainment			
PO	Direct Attainment (D)	Indirect Attainment(I)	Final Attainment
1	83.43	93.11	85.63
2	80.11	97.74	89.80
3	74.32	94.11	79.56
4	76.40	95.74	79.80
5	82.16	87.84	83.46
6	83.04	96.74	87.15
7	82.12	97.11	88.41

Indirect attainment of POs				
PO NO	Question Asked	Response Received	Satisfaction Number	% Attainment
PO1	Are you able to develop the skills of analysing and solving a problem by studying this program	38	35	90.17
PO2	How far the courses and content useful to communicate the complex ideas and information	38	36	95.74
PO3	Does the courses and content useful to model and solve the problems related to society and industry	38	35	92.11
PO4	How far the skills of decision making improved with the practice of mathematics by understanding problems clearly	38	36	96.74
PO5	Level the impact of program on ethics	38	33	87.84
PO6	Does the models developed and their solutions useful to solve the problems related to environment	38	36	95.74
PO7	Does the skills developed are useful for lifelong learning and continuing research.	38	35	93.11

## DEPARTMENT OF COMPUTER SCIENCE

### PROGRAMME OUTCOMES (PO) & PROGRAMME SPECIFIC OUTCOMES OF (PSO) OF M.SC.(COMPUTER SCIENCE), 2021-2022

#### PROGRAMME OUTCOMES:

##### **PO1. Professional Ethics & Social Responsibility:**

Ability to apply and commit to professional ethics following cyber regulations in a global economic environment. Create and design innovative applications to solve complex problems using established practices for the betterment of the society.

##### **PO2. Critical Thinking, Business Analytics & Problem Solving and Innovation:**

An ability to apply knowledge of mathematics and computer science practices to build Innovative Public & Private Sector Applications involving complex computing problem solving.

##### **PO3. Global Exposure and Multi Cultural Understanding:**

An ability to understand the impact of system solutions in a contemporary, global, economical, environmental, cultural and societal context for sustainable development.

##### **PO4. Technical Expertise and Knowledge in Multiple Domains:**

Ability to develop an understanding of modern computing concepts and architectures from a design and performance perspective of various domains.

##### **PO5. Effective Communication:**

Ability to communicate effectively and present technical & project management information using audio visual tools as well as in oral and written reports.

##### **PO6. Leadership and Team Work:**

An ability to perform effectively adapting as per requirement as an individual and as a leader of teams of individuals.

**PO7. Self-directed and Life-long Learning:** An ability to appreciate the importance of goal setting and to recognize the need for life-long learning.

## **PROGRAMME SPECIFIC OUTCOMES:**

PSO means expertise of graduates of a certain program. PSOs of M.Sc.(Computer Science) are:

**PSO1.** To make the students industry ready as far as possible to enhance their employability in the industries.

**PSO2.** Create an ambience of education through *faculty training, self learning, sound academic practices* and *research endeavors*.

# MASTER OF COMPUTER SCIENCES

## SEMESTER I:

### 20CS1T1: PROBLEM SOLVING USING PYTHON PROGRAMMING

#### Course Outcomes:

On successful completion of this course, the students

CO1: Understand basics of Python Programming. (PO4,PSO1)

CO2: Gain knowledge on *Decision Control Statements* and *Functions & Modules*. (PO2,PO4,PSO1)

CO3: Be familiar with *Python Strings* and *Data Structures*. (PO4, PSO1)

CO4: Have knowledge on *Classes & Objects*. (PO4, PSO1)

CO5: Apply *Inheritance, Error and Exception Handling* and *Operator Overloading*. (PO4,PSO1)

### 20CS1T2: COMPUTER ORGANIZATION

#### Course Outcomes:

On successful completion of this course, the students:

CO1: Understand Digital Logic Circuits, Digital Components and Data Representation. (PO2,PSO1)

CO2: Know Register Transfer and Micro Operations and Basic Computer Organization and Design. (PO2,PSO1)

CO3: Be familiar with Micro Programmed Control and Central Processing Unit. (PO2,PSO1)

CO4: Have knowledge on Computer Arithmetic. (PO2,PSO1)

CO5: Understand Input-Output Organization & Memory Organization. (PO2,PSO1)

### 20CS1T3: SOFTWARE ENGINEERING

#### Course Outcomes:

On successful completion of this course, the students:

CO1: Understand various *Software Engineering Methods, Practices, Process Models* and *Agile Development Strategies*. (PO4, PO5, PO6, PSO1)

CO2: Illustrate *Core Principles, Requirements & Modelling Concepts*. (PO5, PO6, PSO1)

CO3: Identify different Software Testing Approaches and various aspects of Software Quality Assurance. (PO4, PO5, PO6, PSO1)

CO4: Classify various *Process & Project Management Concepts*. (PO5, PO6, PSO1)

CO5: Estimate *Software Projects & apply Formal Methods Modelling*. (PO4, PO5, PO6, PSO1)

### 20CS1T4: DATABASE MANAGEMENT SYSTEMS

#### Course Outcomes:

On successful completion of this course, the students:

CO1: Understands the *Concepts & Architecture* of Databases. (PO2, PO4, PSO1)

CO2: Able to apply simple and complex SQL Queries & Relational Algebra & Relational Calculus operations. (PO2, PO4, PSO1)

CO3: Gain knowledge on *ER, EER Schemas & Normalization*. (PO2, PO4, PSO1)

CO4: Understands *Disk Storage Organization, Hashing & Indexing*. (PO2, PO4, PSO1)

CO5: Be aware of *Transaction Processing, Concurrency Control* and *Distributed Databases*. (PO2, PO4, PSO1)

## 20CS1T5: THEORY OF COMPUTATION

### Course Outcomes:

On successful completion of this course, the students:

CO1: Understand *Fundamentals of Automata* and *Finite Automata*. (PO1,PO2,PSO1)

CO2: Able to apply *Regular Languages*. (PO1,PO2,PSO1)

CO3: Gain knowledge on *Grammar Formalism* and *Context Free Grammars*. (PO1,PO2,PSO1)

CO4: Design *Pushdown Automata*. (PO1,PO2,PSO1)

CO5: Understand *Turing Machine* and *Computability Theory*. (PO1,PO2,PSO1)

## 20CS1T5: PROBLEM SOLVING USING PYTHON PROGRAMMING LAB

### Course Outcomes:

On successful completion of this course, the students:

CO1: Understand basics of *Python Programming*. (PO1,PO2,PO4, PSO1)

CO2: Gain knowledge on *Decision Control Statements* and *Functions & Modules*. (PO1,PO2,PO4, PSO1)

CO3: Be familiar with *Python Strings* and *Data Structures*. (PO1,PO2,PO4, PSO1)

CO4: Apply *Inheritance, Error and Exception Handling* and *Operator Overloading*. (PO1,PO2,PO4, PSO1)

CO5: Able to connect Database and perform Database Access. (PO1,PO2,PO4, PSO1)

## 20CS1L2: DBMS LAB

### Course Outcomes:

CO1: Create Database using DDL Commands. (PO4,PSO1)

CO2: Retrieve Data from database using DML for a given situation. (PO4,PSO1)

CO3: Familiarize with a Query Language through basic SQL Queries. (PO4,PSO1)

CO4: Experiment Nested Query, Joins, Integrity Constraints and Views in database. (PO4,PSO1)

CO5: Demonstrate Trigger, Function and Procedure using PL/SQL. (PO4,PSO1)

## **SEMESTER II:**

## 20CS2T1: COMPUTER NETWORKS

### Course Outcomes:

At the end of this course students will be able to:

CO1: Understand functionality of Layered Network Architecture, Different types of Transmission Media. (PO4,PSO1)

CO2: Understand various Networks and their functions. (PO4,PSO1)

CO3: Understand the IP Addresses and various Routing Algorithms used in internetworking. (PO4,PSO1)

CO4: Understand different Transport Layer Protocols. (PO4,PSO1)

CO5: Understand the various Application Layer Protocols and Security Issues over internet. (PO4,PSO1)

## 20CS2T2: DATA STRUCTURES

### Course Outcomes:

On successful completion of this course, the students:

CO1: To define data structures, operation of data structure, time and space complexities. (PO2,PO4,PSO1)

CO2: To understand concepts of string processing, arrays, records and pointers, linked lists, stacks, queues, recursion, trees, graphs & searching techniques. about searching and sorting techniques. (PO2,PO4,PSO1)

CO3: To implement applications of linked lists, stacks, queues, trees, graphs, sorting & searching techniques. (PO2,PO4,PSO1)

CO4: To analyze applications of linked lists, stacks, queues, trees, graphs, sorting & searching techniques. (PO2,PO4,PSO1)

CO5: To evaluate applications of linked lists, stacks, queues, trees, graphs, sorting & searching techniques in terms of time & space complexity. (PO2,PO4,PSO1)

## 20CS2T3: WEB TECHNOLOGIES

### Course Outcomes:

On successful completion of this course, the students:

CO1: Students are able to describe the concepts of WWW including browser and HTTP protocol and various HTML tags and use them to develop the user friendly web pages. (PO2,PSO1)

CO2: Students will be able to use the JavaScript and VBScript to develop the dynamic web pages. (PO2,PSO1)

CO3: Students will be able to define the CSS with its types and develop the modern web pages using the HTML and XML elements with different layouts as per need of applications. (PO2,PSO1)

CO4: Students use server side scripting with PHP to generate the web pages dynamically using the database connectivity. (PO2,PSO1)

CO5: Develop the modern Web applications using the client and server side technologies and the web design fundamentals. (PO2,PSO1)

## 20CS2T4: OPERATING SYSTEMS

### Course Outcomes:

On successful completion of this course, the students:

CO1: Understand the Basic Concepts of Operating System, Operating System Structure and Process Concept. (PO2,PSO1)

CO2: Applying concepts of Threads, Process Synchronization & CUP Scheduling. (PO2,PSO1)

CO3: Understand Deadlock, Main Memory & Virtual Memory. (PO2,PSO1)

CO4: Explain Mass Storage Structure, File System Interface & File System Implementation. (PO2,PSO1)

CO5: Understanding on I/O Systems, Protection & Security. (PO2,PSO1)

## 20OE02: MOBILE APPLICATION DEVELOPMENT

### Course Outcomes:

Upon successful completion of the course, the student will be able to:

- CO1: Make the students understand the basics of Mobile Applications and Android Environment. (PO2,PO4,PSO1)
- CO2: Understand Activities, Intents and Fragments. (PO2,PO4,PSO1)
- CO3: Know the Android User Interface and Designing User Interface with Views. (PO2,PO4,PSO1)
- CO4: Understand Data Persistence, Content Providers and Multimedia. (PO2,PO4,PSO1)
- CO5: To Know Telephony Exploring and Notifications and Alarms. (PO2,PO4,PSO1)

## 20CS2L1: COMPUTER NETWORKS & OPERATING SYSTEMS LAB

### Course Outcomes:

On successful completion of this course, the students:

- CO1: Practice Unix Shell Scripting and AWK Programming. (PO2,PO4,PSO1)
- CO2: Apply Operating System Scheduling Algorithms. (PO2,PO4,PSO1)
- CO3: Prepare Patch Cards and Implement Network Monitoring Tools. (PO2,PO4,PSO1)
- CO4: Implement Network Programming to obtain IP address, Machine Name and Communication etc. (PO2,PO4,PSO1)
- CO5: Design various networks with CISCO Packet Tracer and implement Network Algorithms. (PO2,PO4,PSO1)

## 20CS2L2: DATA STRUCTURES LAB

### Course Outcomes:

On successful completion of this course, the students:

- CO1: Understands the concepts of Stacks, Queues, and Tree Traversals. (PO2,PO4,PSO1)
- CO2: Apply the operations of Singly Linked Lists, Doubly Linked Lists, Circular Linked Lists and Operations on Stacks and Queues. (PO2,PO4,PSO1)
- CO3: Apply operations on Binary Search Tree, Binary Search Tree Traversals, Sparse Matrix and DFS & BFS Algorithm. (PO2,PO4,PSO1)
- CO4: Implement Searching & Sorting Algorithms. (PO2,PO4,PSO1)
- CO5: Implement AVL-Trees and B-Trees. (PO2,PO4,PSO1)

## **SEMESTER III:**

## 20CS3T1: INTERNET OF THINGS

### Course Outcomes:

On successful completion of the course student will be able to:

- CO1: Attain knowledge over view of *Internet of Things*. (PO4,PSO1)
- CO2: Understand *Models, Layers & Standardization*. (PO4,PSO1)
- CO3: Apply *Protocols & Design Principles* for Connected Devices. (PO4,PSO1)

CO4: Understand *Internet Connectivity Principles, Protocols & Application Layer Protocols*. (PO4,PSO1)

CO5: Understand *Data Acquiring, Business Models and Business Processes*. (PO4,PSO1)

#### 20CS3T2: CRYPTOGRAPHY & NETWORK SECURITY

Course Outcomes:

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

CO1: Understand *Computer & Network Security Concepts, Classical Encryption Techniques and Advanced Encryption Standard*. (PO4,PSO1)

CO2: Gain knowledge on *Number Theory, Public Key Cryptography and RSA, Other Public-Key Crypto Systems and Message Authentication Codes*. (PO4,PSO1)

CO3: Know *Digital Signatures, Key Management and Distribution and User Authentication*. (PO4,PSO1)

CO4: Understand *Transport Level Security, Electronic Mail Security and IP Security*. (PO4,PSO1)

CO5: Gain knowledge about *Intruders and Firewalls*. (PO4,PSO1)

#### 20CS3T3: DESIGN & ANALYSIS OF ALGORITHMS

Course Outcomes:

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

CO1: Understand *Basic Ideas about Analysis of Algorithms and the Concept of Data Structures*. (PO2,PSO1)

CO2: Know *Divide and Conquer, Greedy Methods and Solving Various Problems* by applying them. (PO2,PSO1)

CO3: Apply *Dynamic Programming Method and Basic Traversal and Search Techniques* to solve various Problems. (PO2,PSO1)

CO4: Understand *Backtracking and Branch and Bound Techniques* to Design Algorithms. (PO2,PSO1)

CO5: Categorize *NP-Hard and NP-Complete Problems*. (PO2,PSO1)

#### 20CS3T4: DATA MINING TECHNIQUES

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Understand the *Basics of Data Mining and Data Pre-Processing Techniques*. (PO4,PSO1)

CO2: Aware of constructing the *Data Warehouse, OLAP and relevant Data Model Concepts*. (PO4,PSO1)

CO3: Understand the *Frequent Itemset Mining Methods* and Different Levels in Association Rules. (PO4,PSO1)

CO4: Understand the *Basic Concepts in Classification and Advanced Classification Methods* by implementing *Various Algorithms*. (PO4,PSO1)

CO5: Find the similarities among the data using *Clustering Algorithms and Outlier Analysis*. (PO4,PSO1)

#### 20CS3L1: WEB TECHNOLOGIES LAB

Course Outcomes: On successful completion of the course student will be able to:

CO1: Build functional *Web Applications HTML*. (PO2,PO4,PSO1)

CO2: Incorporates *Multimedia Capabilities and Web Page Designs* using *Cascading Style Sheets*. (PO2,PO4,PSO1)

CO3: Code *Client Server Interaction Programs* using *Java Based Server Technology* named *Servlets*. (PO2,PO4,PSO1)



CO4: Create *Dynamic Web Pages* where in *Client Interaction* is facilitated using Advanced Server Technology like *JSP*. (PO2,PO4,PSO1)

CO5: Integrate *Offline Data Storage, Background Processes* and APIs using *Database Connectivity* and *ASP*. (PO2,PO4,PSO1)

## 20CS3L1: DATA MINING LAB

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Understand the *Various Kinds of Tools*. (PO2,PO4,PSO1)

CO2: Apply *Mining Techniques* for *Realistic Data*. (PO2,PO4,PSO1)

CO3: Understand the *Basic Concepts* in R and *Weka*. (PO2,PO4,PSO1)

CO4: Understand how to import and export *CSV Files* and *Package* installation in R. (PO2,PO4,PSO1)

CO5: Develop and visualization of *Data Mining Algorithms* in R. (PO2,PO4,PSO1)

## SEMESTER IV:

### 20CS4M1: BLOCK CHAIN AND ITS APPLICATIONS (MOOCS)

Course Outcomes:

After the successful completion of this module, students will be able to:

CO1: *Introduction and importance of Block Chain*. (PO4,PSO1)

CO2: Understand the *Cypro Currencies and Digital Signatures*. (PO4,PSO1)

CO3: Be familiar with *Elements of Block Chain and its models*. (PO4,PSO1)

CO4: Apply developing Smart Contracts. (PO4,PSO1)

CO5: Understand Block Chain and its Applications. (PO4,PSO1)

### 20CS4T1: BIG DATA AND ANALYTICS

Course Outcomes:

Upon successful completion of this course, the student will be able to understand:

CO1: Big data and its role in daily life. (PO2,PO4,PSO1)

CO2: How data is stored and processed in Hadoop. (PO2,PO4,PSO1)

CO3: *Map Reduce & Modern Databases* used in *Big Data Analytics*. (PO2,PO4,PSO1)

CO4: Hadoop Eco System. (PO2,PO4,PSO1)

CO5: Visualization of data with Tableau. (PO2,PO4,PSO1)

### 20CS4T2: ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Course Outcomes:

At the end of this course, students will be able to:

CO1: Identify problems that are amenable to *AI Techniques* and analyse *Search Techniques* to solve those problems. (PO2,PO4,PSO1)

CO2: Understand *Representation Languages* like *First Order Logic*. (PO2,PO4,PSO1)

CO3: Formalize and implement different *AI Algorithms*, various *Knowledge Representations* and identify the importance of planning to solve *AI Problems*. (PO2,PO4,PSO1)

CO4: Understand about basics of *Machine Learning* and *Conceptual Learning*. (PO2,PO4,PSO1)

CO5: Acquire knowledge about *ANN* and *Instance Based Learning*. (PO2,PO4,PSO1)

### 20CS4T3: CLOUD COMPUTING

Course Outcomes: On successful completion of the course student will be able to:

CO1: Articulate the *Main Concepts, Key Technologies, Strengths, and Limitations* of *Cloud Computing* and the core issues of *Virtualization*.(PO1,PO2,PO4,PSO1)

CO2: Understand the *Open Source Architectures and Services of Cloud Computing*. (PO1,PO2,PO4,PSO1)

CO3: Develop and deploy *Cloud Applications* using *Popular Cloud Platforms*. (PO1,PO2,PO4,PSO1)

CO4: Explore the *Risks, Consequences and Costs of Cloud Computing* and understand the implementations of *AAA Model* in the *Cloud*. (PO1,PO2,PO4,PSO1)

CO5: Introduce the broad perspective of *Mobile Cloud Computing*. (PO1,PO2,PO4,PSO1)

### 20CS4L1: BIG DATA AND ANALYTICS LAB

Course Outcomes: At the end of this course, students should be able to:

CO1: To implement Hadoop Distributed File System. (PO2,PO4,PSO1)

CO2: Evaluate Map-reduce in Java / Python in HDFS. (PO2,PO4,PSO1)

CO3: Evaluate to implement Processing Data with NoSQL (MongoDB). (PO2,PO4,PSO1)

CO4: Evaluate Map Reduce in Java/Python, Apache Pig. (PO2,PO4,PSO1)

CO5: Extracting Data, Data Blending, Moving from Test to Production Databases in Tableau, Connecting to various Data Sources, Creation of Charts, Data Blending and Trend Lines in Tableau for Data Visualization. (PO2,PO4,PSO1)

### 20CS4P1: PROJECT WORK

Course Outcomes:

CO1: Formulate a real world problem and develop its requirements. (PO1,PO2,PO3,PO4,PO5,PO6,PO7,PSO1,PSO2)

CO2: Develop a design solution for a set of requirements. (PO1,PO2,PO3,PO4,PO5,PO6,PO7,PSO1,PSO2)

CO3: Test and validate the conformance of the developed prototype against the original requirements of the problem. (PO1,PO2,PO3,PO4,PO5,PO6,PO7,PSO1,PSO2)

CO4: Work as a responsible member and possibly a leader of a team in developing software solutions. (PO1,PO2,PO3,PO4,PO5,PO6,PO7,PSO1,PSO2)

CO5: Express technical ideas, strategies and methodologies in written form. (PO1,PO2,PO3,PO4,PO5,PO6,PO7,PSO1,PSO2)





PARVATHANENI BRAHMAYYA(P.B.)

**SIDDHARTHA COLLEGE OF ARTS & SCIENCE**

VIJAYAWADA, ANDHRA PRADESH

Autonomous Since 1988

NAAC Accredited at 'A+' (Cycle III)

ISO 9001:2015 Certified



**Attainment of Programme Outcomes and Course Outcomes as Evaluated by  
the Institution for M.C.A Programme, 2021-2022**

Course Code	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7
<b>FIRST SEMESTER</b>								
20CA1T1	CO1		M	H				
	CO2	L			M			
	CO3		M			L		
	CO4				H			
	CO5						H	
20CA1T2	CO1			M	H			
	CO2					L		
	CO3			M		L		H
	CO4		L		M		H	
	CO5		L	H				
20CA1T3	CO1		M					
	CO2			H				
	CO3		M					
	CO4			H				
	CO5				H			
20CA1T4	CO1			L	M			
	CO2	M			L			
	CO3		L		H			
	CO4			H				
	CO5	H						
20CA1T5	CO1		M					
	CO2				M			
	CO3				H			
	CO4				H			
	CO5			H				
20CA1T6	CO1							
	CO2	H						
	CO3		M		H			M
	CO4							
	CO5							
20CS1L1	CO1	H						
	CO2		M					

	C03				M			
	C04				M			
	C05				L			
20CS1L1	C01		L					M
	C02			M				H
	C03				M			
	C04					L		
	C05	M						
20CA1S1	C01						M	H
	C02	M						
	C03							H
	C04							M
	C05	L						

SECOND SEMESTER								
20CA2T1	C01			M	M			
	C02				H			
	C03				M			
	C04				M			
	C05			L				
20CA2T2	C01		H					H
	C02		L					M
	C03		M					
	C04	M	M					
	C05						H	M
20CA2T3	C01		M					
	C02				H			
	C03		H					
	C04				H			
	C05			M				
20CA2T4	C01		L					M
	C02		M					
	C03	M						M
	C04	L						H
	C05	H						H
20OE02	C01			L	M			H
	C02			M				
	C03		M					H

	C04	M			M			
	C05	M						
20CA2L1	C01	L	M					
	C02		M				H	
	C03			M	M			
	C04		H		M			
	C05				M	L		
20CA2L2	C01	M			L			
	C02				M			
	C03	M						
	C04				M			
	C05	H						M
20CA2TRW	C01							M
	C02							L
	C03							M
	C04							L
	C05		H	M				M

THIRD SEMESTER								
20CA3T1	C01	L	M					
	C02		L		H			
	C03			M	L			
	C04			M	M			
	C05		M					H
20CA3T2	C01				H			
	C02		M					
	C03			H				
	C04		M					
	C05	H						M
20CA3T3	C01	H		M				
	C02	H			M			
	C03				M			
	C04		L					
	C05	M						
20OE09	C01		M					
	C02				H	L		
	C03				M			
	C04		L			L		

	CO5	M					M	
20CA3T4	CO1	M						
	CO2				H			
	CO3			M				
	CO4				M			
	CO5				H			
20CA3T5	CO1	H						
	CO2		M					
	CO3		M					
	CO4			M				
	CO5				L			
20CS3L1	CO1	M						
	CO2		L					
	CO3		M					
	CO4			M				
	CO5			M	M			
20CS3L2	CO1	M						
	CO2		L					
	CO3		M					
	CO4			M				
	CO5			M	M			

FOURTH SEMESTER								
20CA4M1	CO1	L		L				
	CO2				M			H
	CO3	M	M					
	CO4				L			
	CO5		L	M				
20CA4T1	CO1	L		L				
	CO2				M			M
	CO3			L				
	CO4			M	M			
	CO5				M			M
20CA4T2	CO1	L	M	L				
	CO2	M	L		L			
	CO3	M						M

	CO4	L						H
	CO5	L						M
20CA4T3	CO1	L	M	L				
	CO2	H	H		L			
	CO3	M						M
	CO4	L						H
	CO5	L						M
20CA4P1	CO1	H						H
	CO2					L		M
	CO3					L		L
	CO4						H	H
	CO5						M	M



	H	10	4	7	15	0	6	15
	M	16	24	16	27	0	3	18
	L	14	12	9	8	10	0	3
<b>Total weightage of the course</b>		<b>152</b>	<b>120</b>	<b>120</b>	<b>224</b>	<b>10</b>	<b>63</b>	<b>192</b>
20CA1T1	C.Weightage	0.66	5.00	7.50	5.36	10.00	14.29	0.00
20CA1T2	C.Weightage	0.00	1.67	12.50	5.36	20.00	14.29	4.69
20CA1T3	C.Weightage	0.00	5.00	15.00	4.02	0.00	0.00	0.00
20CA1T4	C.Weightage	7.89	0.83	8.33	5.80	0.00	0.00	0.00
20CA1T5	C.Weightage	0.00	2.50	7.50	9.38	0.00	0.00	0.00
20CA1T6	C.Weightage	3.00	1.00	0.00	2.13	0.00	0.00	0.00
20CA1L1	C.Weightage	2.92	1.50	0.00	1.00	0.00	0.00	0.00
20CA1L2	C.Weightage	0.00	0.83	2.50	1.34	10.00	0.00	6.25
20CA1S1	C.Weightage	2.63	0.00	0.00	0.00	0.00	4.76	10.94
20CA2T1	C.Weightage	0.00	0.00	3.33	8.04	0.00	0.00	0.00
20CA2T2	C.Weightage	1.97	13.33	0.00	0.00	0.00	14.29	7.81
20CA2T3	C.Weightage	0.00	10.00	2.50	8.04	0.00	0.00	0.00
20CA2T4	C.Weightage	8.55	3.33	0.00	0.00	0.00	0.00	12.50
20CA2T4	C.Weightage	2.00	1.00	2.33	1.68	0.00	0.00	3.38
20OE02	C.Weightage	1.95	1.50	1.00	1.00	0.00	0.00	6.00
20CA2L1	C.Weightage	0.66	12.50	2.50	4.02	10.00	14.29	0.00
20CA2L2	C.Weightage	9.87	0.00	0.00	3.13	0.00	0.00	1.56
20CS2TRW	C.Weightage	0.00	0.00	0.00	0.00	0.00	0.00	4.17
20CA3T1	C.Weightage	0.66	5.83	5.00	5.80	0.00	0.00	4.69
20CA3T2	C.Weightage	5.92	5.00	7.50	4.02	0.00	0.00	1.56
20CA3T3	C.Weightage	13.82	0.83	2.50	2.68	0.00	0.00	0.00
20OE09	C.Weightage	1.97	3.33	0.00	5.36	20.00	4.76	0.00
20CA3T4	C.Weightage	0.97	0.00	2.00	5.00	0.00	0.00	0.00
20CA3T5	C.Weightage	1.00	0.00	0.50	4.32	0.00	0.00	0.00
20CA3L1	C.Weightage	5.92	5.00	2.50	0.45	0.00	0.00	0.00
20CA3L2	C.Weightage	1.97	3.33	5.00	1.34	0.00	0.00	0.00
20CA4M1	C.Weightage	10.53	10.00	1.68	4.47	10.00	14.29	7.80
20CA4T1	C.Weightage	2.63	3.33	3.33	1.79	0.00	0.00	4.69
20CA4T3	C.Weightage	0.66	0.00	4.17	4.02	0.00	0.00	3.13
20CA4T4	C.Weightage	5.92	3.36	0.83	0.45	0.00	0.00	7.81
20CA4P1	C.Weightage	5.93	0.00	0.00	0.00	20.00	19.03	13.02
		100.00	100.00	100.00	100.00	100.00	100.00	100.00

## CO ATTAINMENT

S.NO	COURSE	Heads of Passing (% attainment) Direct			Indirect (I)	Average course Attainment
		IA TEST(30M)	SEM END EXAM(70M)	Average % Attainment(D)		
1	Problem Solving Using Python Programming	83.72	51.16	60.93	86.05	68.46
2	Computer Organization	51.16	25.58	33.25	88.37	49.79
3	Software Engineering	93.02	67.44	75.11	88.37	79.09
4	Database Management Systems	56.90	37.20	43.11	88.37	56.69
5	Discrete Mathematical Structures	74.41	46.51	54.88	86.05	64.23
6	Probability & Statistics	100.00	97.45	99.21	98.23	89.34
7	Problem Solving Using Python Programming Lab	100.00	100.00	100.00	86.05	95.82
8	DBMS Lab	100.00	100.00	100.00	88.37	96.51
9	Seminar	100.00	100.00	100.00	86.05	95.82
10	Data Mining Techniques	56.09	60.97	59.51	85.37	67.27
11	Operating Systems	100	51.21	65.85	95.12	74.63
12	Data Structures	100.00	19.51	43.66	95.12	59.10
13	Computer Networks	100.00	19.51	43.66	92.68	58.36
14	Web Technologies	100.00	31.70	52.19	92.68	64.34
15	Mobile Application Development	100.00	100.00	100.00	85.37	95.61
16	Web Technologies Lab	100	100	100.00	85.37	95.61
17	Data Structures Lab	100.00	100.00	100.00	81.25	94.38
18	Technical Report Writing	89.00	98.00	100.00	87.23	98.45
19	Big Data and Analytics	100.00	63.41	74.39	95.12	80.61
20	Artificial Intelligence & Machine Learning	70.73	19.50	34.87	96.50	53.36
21	Design & Analysis of Algorithms	100.00	58.53	70.97	98.33	79.18
22	Cloud Computing	92.68	53.65	65.36	93.68	73.86
23	Cryptography & Network Security	92.68	63.41	72.19	94.68	78.94
24	Big Data and Analytics Lab	100	100	100.00	95.68	98.70
25	Data Mining Lab	100	100	100.00	96.68	99.00
26	MOOCS	90.24	75.6	79.99	91.28	83.38
27	Data Wrangling and Data Visualization	95.12	65.85	74.63	91.05	79.56
28	Applied Data Analysis	97.56	87.8	90.73	90	90.51
29	Deep Learning	95.3	89.2	91.4	92	91.5
30	Project Work	100	100	100.00	74.05	92.22

Weighted Contribution of the course in attainment of POs						
PO1	PO2	PO3	PO4	PO5	PO6	PO7
0.45	3.42	5.13	3.67	6.85	9.78	0.00
0.00	0.83	6.22	2.67	9.96	7.11	2.33
0.00	3.95	11.86	3.18	0.00	0.00	0.00
4.48	0.47	4.72	3.29	0.00	0.00	0.00
0.00	1.61	4.82	6.02	0.00	0.00	0.00
5.67	2.40	0.00	2.99	0.00	0.00	0.00
0.00	0.80	2.41	1.29	9.65	0.00	6.03
2.52	0.00	0.00	0.00	0.00	4.56	10.48
0.00	0.00	2.24	5.41	0.00	0.00	0.00
1.47	9.95	0.00	0.00	0.00	10.66	5.83
0.00	5.91	1.48	4.75	0.00	0.00	0.00
4.99	1.95	0.00	0.00	0.00	0.00	7.30
2.54	1.61	2.14	1.72	0.00	0.00	6.03
0.63	11.95	2.39	3.84	9.56	13.66	0.00
9.44	0.00	0.00	2.99	0.00	0.00	1.49
0.00	0.00	0.00	0.00	0.00	0.00	3.93
0.53	4.70	4.03	4.68	0.00	0.00	3.78
3.16	2.67	4.00	2.14	0.00	0.00	0.83
10.94	0.66	1.98	2.12	0.00	0.00	0.00
1.46	2.46	0.00	3.96	14.77	3.52	0.00
1.56	0.00	1.97	7.40	0.00	0.00	0.00
5.84	4.94	2.47	0.44	0.00	0.00	0.00
1.95	3.30	4.95	1.33	0.00	0.00	0.00
0.65	0.00	0.83	3.99	9.93	14.19	0.00
2.19	2.78	2.78	1.49	0.00	0.00	3.91
0.52	0.00	3.31	3.20	0.00	0.00	2.49
5.36	3.02	0.75	0.40	0.00	0.00	7.07
0.97	5.45	0.00	3.54	4.45	0.03	3.33
9.60	9.73	0.81	0.43	0.00	0.00	7.60
5.46	0.00	0.00	0.00	18.44	17.56	12.01
<b>82.04</b>	<b>84.56</b>	<b>71.32</b>	<b>76.94</b>	<b>83.61</b>	<b>81.07</b>	<b>84.45</b>

Final PO Attainment			
PO	Direct Attainment (D)	Indirect Attainment(I)	Final Attainment
1	85.43	97.11	82.63
2	84.14	96.32	89.91
3	75.22	97.26	81.77
4	77.50	96.74	89.71
5	83.45	86.33	86.67
6	85.41	97.22	88.23
7	86.12	96.11	87.88

Indirect attainment of POs				
PO NO	Question Asked	Response Received	Satisfaction Number	% Attainment
PO1	Are you able to develop the skills of analysing and solving a problem by studying this program	51	50	98.03
PO2	How far the courses and content useful to communicate the complex ideas and information	51	49	96.07
PO3	Does the courses and content useful to model and solve the problems related to society and industry	51	48	94.11
PO4	How far the skills of decision making improved with the practice of mathematics by understanding problems clearly	51	49	96.07
PO5	Level the impact of program on ethics	51	49	96.07
PO6	Does the models developed and their solutions useful to solve the problems related to environment	51	50	98.03
PO7	Does the skills developed are useful for lifelong learning and continuing research.	51	48	94.11

## DEPARTMENT OF COMPUTER SCIENCE

### PROGRAMME OUTCOMES (PO) & PROGRAMME SPECIFIC OUTCOMES OF (PSO) OF M.C.A, 2021-2022

#### PROGRAMME OUTCOMES (POS)

**PO1. Technical Expertise and Knowledge in Multiple Domains:** Ability to develop an understanding of modern computing concepts and architectures from a design and performance perspective of various domains.

**PO2. Assessment from System level perspective:** Able to analyze and appreciate the structure of computer systems and the processes involved in their construction at various levels of detail and abstraction.

**PO3. Critical Thinking, Business Analytics & Problem Solving and Innovation:** An ability to apply knowledge of mathematics and computer science practices to build Innovative Public & Private Sector Applications involving complex computing problem solving and in research.

**PO4. Professional Ethics & Social Responsibility:** Ability to apply and commit to professional ethics following cyber regulations in a global economic environment. Create and design innovative applications to solve complex problems using established practices for the betterment of the society.

**PO5. Apposite to Industry:** Gain exposure to multiple programming languages, tools, paradigms, and technologies as well as the fundamental underlying principles throughout their education there by making them the right choice for industry positions.

**PO6. Effective Communication & Leadership:** Ability to communicate effectively and present technical & project management information using audio visual tools as well as in oral and written reports. Rise up to the need and be able to lead teams of individuals.

**PO7. Life-long Learning:** Understand the importance of, and possess pre-requisite skill set to undertake life-long independent learning in the context of contemporary technological advancements.

#### PROGRAMME SPECIFIC OUTCOMES (PSOs)

**PSO1.** To make the students industry ready as far as possible to enhance their employability in the industries.

**PSO2.** Create an ambience of education through *faculty training, self learning, sound academic practices and research endeavors.*

# MASTER OF COMPUTER APPLICATIONS

## SEMESTER I:

### 20CA1T1: PROBLEM SOLVING USING PYTHON PROGRAMMING

#### Course Outcomes:

On successful completion of this course, the students

CO1: Understand basics of Python Programming. (PO4,PSO1)

CO2: Gain knowledge on *Decision Control Statements and Functions & Modules*. (PO2,PO4,PSO1)

CO3: Be familiar with *Python Strings and Data Structures*. (PO4, PSO1)

CO4: Have knowledge on *Classes & Objects*. (PO4, PSO1)

CO5: Apply *Inheritance, Error and Exception Handling and Operator Overloading*. (PO4,PSO1)

### 20CA1T2: COMPUTER ORGANIZATION

#### Course Outcomes:

On successful completion of this course, the students:

CO1: Understand Digital Logic Circuits, Digital Components and Data Representation. (PO2,PSO1)

CO2: Know Register Transfer and Micro Operations and Basic Computer Organization and Design. (PO2,PSO1)

CO3: Be familiar with Micro Programmed Control and Central Processing Unit. (PO2,PSO1)

CO4: Have knowledge on Computer Arithmetic. (PO2,PSO1)

CO5: Understand Input-Output Organization & Memory Organization. (PO2,PSO1)

### 20CA1T3: SOFTWARE ENGINEERING

#### Course Outcomes:

On successful completion of this course, the students:

CO1: Understand various *Software Engineering Methods, Practices, Process Models and Agile Development Strategies*. (PO4, PO5, PO6, PSO1)

CO2: Illustrate *Core Principles, Requirements & Modelling Concepts*. (PO5, PO6, PSO1)

CO3: Identify different Software Testing Approaches and various aspects of Software Quality Assurance. (PO4, PO5, PO6, PSO1)

CO4: Classify various *Process & Project Management Concepts*. (PO5, PO6, PSO1)

CO5: Estimate *Software Projects & apply Formal Methods Modelling*. (PO4, PO5, PO6, PSO1)

### 20CA1T4: DATABASE MANAGEMENT SYSTEMS

#### Course Outcomes:

On successful completion of this course, the students:

CO1: Understands the *Concepts & Architecture* of Databases. (PO2, PO4, PSO1)

CO2: Able to apply simple and complex SQL Queries & Relational Algebra & Relational Calculus operations. (PO2, PO4, PSO1)

CO3: Gain knowledge on *ER, EER Schemas & Normalization*. (PO2, PO4, PSO1)

CO4: Understands *Disk Storage Organization, Hashing & Indexing*. (PO2, PO4, PSO1)

CO5: Be aware of *Transaction Processing, Concurrency Control and Distributed Databases*. (PO2, PO4, PSO1)

## 20CS1T5: DISCRETE MATHEMATICAL STRUCTURES

Course Outcomes:

On successful completion of this course, the students:

CO1: Understand mathematical reasoning in order to construct mathematical arguments. (PO3,PSO1)

CO2: Perform combinatorial analysis to solve computing problems and analyze algorithms. (PO3,PSO1)

CO3: Demonstrate the abstract mathematical structures used to represent discrete objects and relationships between objects. (PO3,PSO1)

CO4: Model problems in Computer Science using graphs and trees. (PO3,PSO1)

CO5: Apply the principles to solve problems in various domains. (PO3,PSO1)

## 20CA1T6: PROBABILITY AND STATISTICS

Course Outcomes:

On successful completion of this course, the students:

CO1: Understand *Theory of Probability, Random Variables and Distribution-Functions*. (PO3,PSO1)

CO2: Apply Mathematical Expectation and Generating Functions, Probability *Distributions-Discrete Probability Distributions and Distribution-Functions (Cumulative Distribution Function*. (PO3,PSO1)

CO3: Apply *Correlation Analysis and Regression Analysis*. (PO3,PSO1)

CO4: Apply *Test of Hypothesis, Large Sample Tests and Small Sample Tests-I*. (PO3,PSO1)

CO5: Apply *Small Sample Test- Chi-Square and F- Distributions and Analysis of Variance*. (PO3,PSO1)

## 20CA1L1: PROBLEM SOLVING USING PYTHON PROGRAMMING LAB

Course Outcomes:

On successful completion of this course, the students:

CO1: Understand basics of *Python Programming*. (PO1,PO2,PO4, PSO1)

CO2: Gain knowledge on *Decision Control Statements and Functions & Modules*. (PO1,PO2,PO4, PSO1)

CO3: Be familiar with *Python Strings and Data Structures*. (PO1,PO2,PO4, PSO1)

CO4: Apply *Inheritance, Error and Exception Handling and Operator Overloading*. (PO1,PO2,PO4, PSO1)

CO5: Able to connect Database and perform Database Access. (PO1,PO2,PO4, PSO1)



## 20CA1L2: DBMS LAB

### Course Outcomes:

CO1: Create Database using DDL Commands. (PO4,PSO1)

CO2: Retrieve Data from database using DML for a given situation. (PO4,PSO1)

CO3: Familiarize with a Query Language through basic SQL Queries. (PO4,PSO1)

CO4: Experiment Nested Query, Joins, Integrity Constraints and Views in database. (PO4,PSO1)

CO5: Demonstrate Trigger, Function and Procedure using PL/SQL. (PO4,PSO1)

## 20CA1S1: SEMINAR

### Course Outcomes:

1. Provides opportunity for students to develop skills in presentation. (PO1, PO3,PO6,PSO1,PSO2)

2. Discussion of research topics in a public forum. (PO1, PO3,PO6,PSO1,PSO2)

3. Provides students with exposure to a variety of research projects. (PO1, PO3,PO6,PSO1,PSO2)

4. Activities in order to enrich their academic experience. (PO1, PO3,PO6,PSO1,PSO2)

5. Present technical information using audio visual tools as well as in oral and written reports. (PO1, PO3,PO6,PSO1,PSO2)

## **SEMESTER II:**

### 20CSAT1: DATA MINING TECHNIQUES

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Understand the *Basics of Data Mining and Data Pre-Processing Techniques*. (PO4,PSO1)

CO2: Aware of constructing the *Data Warehouse, OLAP and relevant Data Model Concepts*. (PO4,PSO1)

CO3: Understand the *Frequent Itemset Mining Methods* and Different Levels in Association Rules. (PO4,PSO1)

CO4: Understand the *Basic Concepts in Classification and Advanced Classification Methods* by implementing *Various Algorithms*. (PO4,PSO1)

CO5: Find the similarities among the data using *Clustering Algorithms and Outlier Analysis*. (PO4,PSO1)

### 20CA2T2: OPERATING SYSTEMS

#### Course Outcomes:

On successful completion of this course, the students:

CO1: Understand the Basic Concepts of Operating System, Operating System Structure and Process Concept. (PO2,PSO1)

CO2: Applying concepts of Threads, Process Synchronization & CUP Scheduling. (PO2,PSO1)

CO3: Understand Deadlock, Main Memory & Virtual Memory. (PO2,PSO1)

CO4: Explain Mass Storage Structure, File System Interface & File System Implementation. (PO2,PSO1)

CO5: Understanding on I/O Systems, Protection & Security. (PO2,PSO1)

### 20CA2T3: DATA STRUCTURES

Course Outcomes:

On successful completion of this course, the students:

CO1: To define data structures, operation of data structure, time and space complexities. (PO2,PO4,PSO1)

CO2: To understand concepts of string processing, arrays, records and pointers, linked lists, stacks, queues, recursion, trees, graphs & searching techniques. about searching and sorting techniques. (PO2,PO4,PSO1)

CO3: To implement applications of linked lists, stacks, queues, trees, graphs, sorting & searching techniques. (PO2,PO4,PSO1)

CO4: To analyze applications of linked lists, stacks, queues, trees, graphs, sorting & searching techniques. (PO2,PO4,PSO1)

CO5: To evaluate applications of linked lists, stacks, queues, trees, graphs, sorting & searching techniques in terms of time & space complexity. (PO2,PO4,PSO1)

#### 20CA2T4: WEB TECHNOLOGIES

Course Outcomes:

On successful completion of this course, the students:

CO1: Students are able to describe the concepts of WWW including browser and HTTP protocol and various HTML tags and use them to develop the user friendly web pages. (PO2,PSO1)

CO2: Students will be able to use the JavaScript and VBScript to develop the dynamic web pages. (PO2,PSO1)

CO3: Students will be able to define the CSS with its types and develop the modern web pages using the HTML and XML elements with different layouts as per need of applications. (PO2,PSO1)

CO4: Students use server side scripting with PHP to generate the web pages dynamically using the database connectivity. (PO2,PSO1)

CO5: Develop the modern Web applications using the client and server side technologies and the web design fundamentals. (PO2,PSO1)

#### 20OE02: MOBILE APPLICATION DEVELOPMENT

Course Outcomes:

Upon successful completion of the course, the student will be able to:

CO1: Make the students understand the basics of Mobile Applications and Android Environment.(PO2,PO4,PSO1)

CO2: Understand Activities, Intents and Fragments. (PO2,PO4,PSO1)

CO3: Know the Android User Interface and Designing User Interface with Views. (PO2,PO4,PSO1)

CO4: Understand Data Persistence, Content Providers and Multimedia. (PO2,PO4,PSO1)

CO5: To Know Telephony Exploring and Notifications and Alarms. (PO2,PO4,PSO1)

#### 20CA2L1: WEB TECHNOLOGIES LAB

Course Outcomes: On successful completion of the course student will be able to:

CO1: Build functional *Web Applications HTML*. (PO2,PO4,PSO1)

CO2: Incorporates *Multimedia Capabilities* and *Web Page Designs* using *Cascading Style Sheets*. (PO2,PO4,PSO1)

CO3: Code *Client Server Interaction Programs* using *Java Based Server Technology* named *Servlets*. (PO2,PO4,PSO1)

CO4: Create *Dynamic Web Pages* where in *Client Interaction* is facilitated using Advanced Server Technology like *JSP*. (PO2,PO4,PSO1)

CO5: Integrate *Offline Data Storage, Background Processes* and APIs using *Database Connectivity* and *ASP*. (PO2,PO4,PSO1)

## 20CA2L2: DATA STRUCTURES LAB

Course Outcomes:

On successful completion of this course, the students:

CO1: Understands the concepts of Stacks, Queues, and Tree Traversals. (PO2,PO4,PSO1)

CO2: Apply the operations of Singly Linked Lists, Doubly Linked Lists, Circular Linked Lists and Operations on Stacks and Queues. (PO2,PO4,PSO1)

CO3: Apply operations on Binary Search Tree, Binary Search Tree Traversals, Sparse Matrix and DFS & BFS Algorithm. (PO2,PO4,PSO1)

CO4: Implement Searching & Sorting Algorithms. (PO2,PO4,PSO1)

CO5: Implement AVL-Trees and B-Trees. (PO2,PO4,PSO1)

## 20CA2TRW: TECHNICAL REPORT WRITING

Course Outcomes:

6. Provides opportunity for students to develop skills in presentation. (PO1, PO3,PO6,PSO1,PSO2)

7. Discussion of research topics in a public forum. (PO1, PO3,PO6,PSO1,PSO2)

8. Provides students with exposure to a variety of research projects. (PO1, PO3,PO6,PSO1,PSO2)

9. Activities in order to enrich their academic experience. (PO1, PO3,PO6,PSO1,PSO2)

10. Present technical information using audio visual tools as well as in oral and written reports. (PO1, PO3,PO6,PSO1,PSO2)

## **SEMESTER III:**

### 20CA3T1: BIG DATA AND ANALYTICS

Course Outcomes:

Upon successful completion of this course, the student will be able to understand:

CO1: Big data and its role in daily life. (PO2,PO4,PSO1)

CO2: How data is stored and processed in Hadoop. (PO2,PO4,PSO1)

CO3: *Map Reduce & Modern Databases* used in *Big Data Analytics*. (PO2,PO4,PSO1)

CO4: Hadoop Eco System. (PO2,PO4,PSO1)

CO5: Visualization of data with Tableau. (PO2,PO4,PSO1)

### 20CA3T2: ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Course Outcomes:

At the end of this course, students will be able to:

- CO1: Identify problems that are amenable to AI Techniques and analyse Search Techniques to solve those problems. (PO2,PO4,PSO1)
- CO2: Understand Representation Languages like First Order Logic. (PO2,PO4,PSO1)
- CO3: Formalize and implement different AI Algorithms, various Knowledge Representations and identify the importance of planning to solve AI Problems. (PO2,PO4,PSO1)
- CO4: Understand about basics of Machine Learning and Conceptual Learning. (PO2,PO4,PSO1)
- CO5: Acquire knowledge about ANN and Instance Based Learning. (PO2,PO4,PSO1)

### 20CA3T3: DESIGN & ANALYSIS OF ALGORITHMS

#### Course Outcomes:

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

- CO1: Understand *Basic Ideas* about *Analysis of Algorithms and the Concept of Data Structures*. (PO2,PSO1)
- CO2: Know *Divide and Conquer*, *Greedy Methods* and *Solving Various Problems* by applying them. (PO2,PSO1)
- CO3: Apply *Dynamic Programming Method* and *Basic Traversal and Search Techniques* to solve various Problems. (PO2,PSO1)
- CO4: Understand *Backtracking* and *Branch and Bound* Techniques to Design Algorithms. (PO2,PSO1)
- CO5: Categorize *NP-Hard* and *NP-Complete* Problems. (PO2,PSO1)

### 20CA3T4: CLOUD COMPUTING

Course Outcomes: On successful completion of the course student will be able to:

- CO1: Articulate the *Main Concepts, Key Technologies, Strengths, and Limitations* of *Cloud Computing* and the core issues of *Virtualization*. (PO1,PO2,PO4,PSO1)
- CO2: Understand the *Open Source Architectures and Services of Cloud Computing*. (PO1,PO2,PO4,PSO1)
- CO3: Develop and deploy *Cloud Applications* using *Popular Cloud Platforms*. (PO1,PO2,PO4,PSO1)
- CO4: Explore the *Risks, Consequences and Costs of Cloud Computing* and understand the implementations of *AAA Model* in the *Cloud*. (PO1,PO2,PO4,PSO1)
- CO5: Introduce the broad perspective of *Mobile Cloud Computing*. (PO1,PO2,PO4,PSO1)

### 20CA3T5: CRYPTOGRAPHY & NETWORK SECURITY

#### Course Outcomes:

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

- CO1: Understand *Computer & Network Security Concepts, Classical Encryption Techniques and Advanced Encryption Standard*. (PO4,PSO1)
- CO2: Gain knowledge on *Number Theory, Public Key Cryptography and RSA, Other Public-Key Crypto Systems and Message Authentication Codes*. (PO4,PSO1)
- CO3: Know *Digital Signatures, Key Management and Distribution and User Authentication*. (PO4,PSO1)
- CO4: Understand *Transport Level Security, Electronic Mail Security and IP Security*. (PO4,PSO1)
- CO5: Gain knowledge about *Intruders and Firewalls*. (PO4,PSO1)

## 20CA3L1: BIG DATA AND ANALYTICS LAB

Course Outcomes: At the end of this course, students should be able to:

CO1: To implement Hadoop Distributed File System. (PO2,PO4,PSO1)

CO2: Evaluate Map-reduce in Java / Python in HDFS. (PO2,PO4,PSO1)

CO3: Evaluate to implement Processing Data with NoSQL (MongoDB). (PO2,PO4,PSO1)

CO4: Evaluate Map Reduce in Java/Python, Apache Pig. (PO2,PO4,PSO1)

CO5: Extracting Data, Data Blending, Moving from Test to Production Databases in Tableau, Connecting to various Data Sources, Creation of Charts, Data Blending and Trend Lines in Tableau for Data Visualization. (PO2,PO4,PSO1)

## 20CA3L2: DATA MINING LAB

Course Outcomes: On successful completion of this course, the students will be able to

CO1: Understand the *Various Kinds of Tools*. (PO2,PO4,PSO1)

CO2: Apply *Mining Techniques for Realistic Data*. (PO2,PO4,PSO1)

CO3: Understand the *Basic Concepts* in R and *Weka*. (PO2,PO4,PSO1)

CO4: Understand how to import and export *CSV Files* and *Package* installation in R. (PO2,PO4,PSO1)

CO5: Develop and visualization of *Data Mining Algorithms* in R. (PO2,PO4,PSO1)

## **SEMESTER IV:**

### 20CA4M1: BLOCK CHAIN AND ITS APPLICATIONS (MOOCS)

Course Outcomes:

After the successful completion of this module, students will be able to:

CO1: *Introduction and importance of Block Chain*. (PO4,PSO1)

CO2: Understand the *Cypro Currencies and Digital Signatures*. (PO4,PSO1)

CO3: Be familiar with *Elements of Block Chain and its models*. (PO4,PSO1)

CO4: Apply developing Smart Contracts. (PO4,PSO1)

CO5: Understand Block Chain and its Applications. (PO4,PSO1)

### 20CA4T1: DATA WRANGLING AND DATA VISUALIZATION

Course Outcomes:

Upon successful completion of this course, the student will be able to understand:

CO1 : Understand *Data wrangling in real life, Files & Exception Handling*. (PO1,PO3,PSO1,PSO2)

CO2 : How data is stored and processed in *Numpy* and *Pandas*. (PO1,PO3,PSO1,PSO2)

CO3 : Extracting data from different sources. (PO1,PO3,PSO1,PSO2)

CO4: Visualization of Data. (PO1,PO3,PSO1,PSO2)

CO5: Plotting Data. (PO1,PO3,PSO1,PSO2)

## 20CA4T2: APPLIED DATA ANALYSIS

### Course Outcomes:

After the successful completion of this module, students will be able to:

CO1 : *Install, code and use R Programming Language in R Studio IDE to perform basic tasks on Control Flow Statements, Data Structures and can invoke Operations on Data Structures.* (PO1,PO3,PSO1,PSO2)

CO2 : *Understand the Basic Terminologies, Concepts and Techniques employed in Descriptive Statistical Analysis.* (PO1,PO3,PSO1,PSO2)

CO3 : *Be familiar with Basic Graphics and Analysis of ANOVA.* (PO1,PO3,PSO1,PSO2)

CO4 : *Gain knowledge on Basic Multivariate Analysis.* (PO1,PO3,PSO1,PSO2)

CO5 : *Apply how to import Different Files and Connecting Databases to R.* (PO1,PO3,PSO1,PSO2)

## 20CA4T3: DEEP LEARNING

### Course Outcomes:

After the successful completion of this module, students will be able to:

CO1: *Remember inspiration of Neural Networks from Brain, Artificial Neuron and its Architecture, Input and Output Layers in Neural Networks, Activation Functions, Loss Functions, Optimizers, Data Representation for Neural Networks, The gears of Neural Networks.* (PO1,PO3,PSO1,PSO2)

CO2: *Understand Activation Functions, Loss Functions, Optimizers, Training a Neural Net, Feed Forward Mechanism, Back Propagation in Neural Networks, Gradient Descent Algorithm.* (PO1,PO3,PSO1,PSO2)

CO3: *Develop Hand Digit Recognition in Keras, Regression with Neural Networks, Classification With Neural Networks, Building Image Classifier Using Sequential API, Building Regression MLP using Sequential API, Building Complex Models Using Sequential API, Building Dynamic Models using Sequential API.* (PO1,PO3,PSO1,PSO2)

CO4: *Analyze Data Preprocessing in CNN Alexnet, Googlenet, LeNet-5, VGGNet, ResNet, Xception, SENet, Image Classification with CNN using Keras, Transfer Learning in CNN, Using Pre Trained Models from Keras.* (PO1,PO3,PSO1,PSO2)

CO5: *Understand a Recurrent Layer in Keras, Understanding the LSTM and GRU Layers, A LSTM example in Keras, A Temperature Forecasting Problem, Preparing the Data, First Recurrent Baseline.* (PO1,PO3,PSO1,PSO2)

## 20CA4P1: PROJECT WORK

### Course Outcomes:

After the successful completion of this module, students will be able to:

CO1: *Formulate a real world problem and develop its requirements.* (PO1,PO2,PO3,PO4,PO5,PO6,PO7,PSO1,PSO2)

CO2: *Develop a design solution for a set of requirements.* (PO1,PO2,PO3,PO4,PO5,PO6,PO7,PSO1,PSO2)

CO3: *Test and validate the conformance of the developed prototype against the original requirements of the problem.* (PO1,PO2,PO3,PO4,PO5,PO6,PO7,PSO1,PSO2)

CO4: *Work as a responsible member and possibly a leader of a team in developing software solutions.* (PO1,PO2,PO3,PO4,PO5,PO6,PO7,PSO1,PSO2)

CO5: Express technical ideas, strategies and methodologies in written form.  
(PO1,PO2,PO3,PO4,PO5,PO6,PO7,PSO1,PSO2)