



# **SOURASHTRA COLLEGE, MADURAI – 625004**

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS**

**(Under CBCS based on OBE)(with effect from 2023 – 2024)**

1

### **GRADUATE ATTRIBUTES**

1. **(KB) A knowledge base for Computer Science:** Demonstrated competence in university level mathematics, natural sciences, Computer Science fundamentals, and specialized Computer Science knowledge appropriate to the program.
2. **(PA) Problem analysis:** An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex Computer Science problems in order to reach substantiated conclusions
3. **(Inv.) Investigation:** An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data and synthesis of information in order to reach valid conclusions.
4. **(Des.) Design:** An ability to design solutions for complex, open-ended Computer Science problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
5. **(Tools) Use of Computer Science tools:** An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern Computer Science tools to a range of Computer Science activities, from simple to complex, with an understanding of the associated limitations.
6. **(Team) Individual and teamwork:** An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
7. **(Comm.) Communication skills:** An ability to communicate complex Computer Science concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
8. **(Prof.) Professionalism:** An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
9. **(Impacts) Impact of Computer Science on society and the environment:** An ability to analyze social and environmental aspects of Computer Science activities. Such ability includes an understanding of the interactions that Computer Science has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
10. **(Ethics) Ethics and equity:** An ability to apply professional ethics, accountability, and equity.
11. **(Econ.) Economics and project management:** An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of Computer Science and to understand their limitations.
12. **(LL) Life-long learning:** An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge



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2

### **PROGRAMME EDUCATIONAL OBJECTIVES(PEOs)**

#### **B.Sc., COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY)**

<b>PEO 1</b>	To make the students successful in their professional careers, including entrepreneurship using their knowledge in Computer Science and Applications.
<b>PEO 2</b>	To help the students continue to learn and adopt latest technologies to solve real life problems.
<b>PEO 3</b>	To motivate the students pursue research and higher education.
<b>PEO 4</b>	To inculcate in student's professional and ethical attitude, communication skills, teamwork skills, multi-disciplinary approach and an ability to relate computer Science issues with social awareness.
<b>PEO 5</b>	To prepare students to excel in post graduate programmes in Computer Science of to succeed in computing industry profession through quality education.

### **UNDERGRADUATE (UG) PROGRAMME OUTCOMES (POs)**

Undergraduate (B.A., B.Sc., B.Com., B.C.A., B.B.A., etc.) is a 3 – year degree Programme with 6 semesters consisting the following Programme Outcomes (POs) under various criteria including critical thinking, problem solving, effective communication, societal/ citizenship/ ethical credibility, sustainable growth and employable abilities.

<b>PO 1</b>	<b>Critical Thinking:</b> Intellectual exploration of knowledge towards actions in clear and rational manner by understanding the logical connections between ideas and decisions.
<b>PO 2</b>	<b>Problem Solving:</b> Understanding the task/ problem followed by planning and narrow execution strategy that effectively provides the solution.
<b>PO 3</b>	<b>Effective Communication:</b> Knowledge dissemination by oral and verbal mechanisms to the various components of our society.
<b>PO 4</b>	<b>Societal/ Citizenship/ Ethical Credibility:</b> Realization of various value systems/ moral dimensions and demonstrate the empathetic social concern as well as equity in all the decisions, executions and actions.
<b>PO 5</b>	<b>Environmental Concern and Sustainable Growth:</b> Understanding the emerging environmental challenges and provides the possible contribution in sustainable development that integrates environment, economy and employment.
<b>PO 6</b>	<b>Skill Development and Employable Abilities:</b> Adequate training in relevant skill sector and creating employable abilities among the under graduates.



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3

### PROGRAMME SPECIFIC OUTCOMES

On completion of B.Sc., Computer Science (Cloud Computing and Cyber Security) Programme, the students will be able to

<b>PSO 1</b>	think in a critical and logical based manner. Equip with Computer science Technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.
<b>PSO 2</b>	become familiar with suitable software tools of Computer Science and industrial applications to handle issues and solve problems in Mathematics or Statistics and real-time application related sciences.
<b>PSO 3</b>	know when there is a need for information, to be able to identify, locate, evaluate and effectively use that information for the issue or problem at hand.
<b>PSO 4</b>	understand, formulate, develop programming model with logical approaches to and address issues arising in social science, business and other contexts.
<b>PSO 5</b>	acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics, get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of Computing sciences.
<b>PSO 6</b>	receive sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science, develop a range of generic skills helpful in employment, internships & societal activities.

### **DISTRIBUTION OF CREDITS (UG PROGRAMME)**

Part	Semester	Courses	No. of Courses	Hours	Credits	Total Credits
I	I-IV	LANGUAGE	4	6	3	12
II	I-IV	ENGLISH	4	6	3	12
III	I-VI	CORE	17	3-6	3-4	66
III	I-IV	ALLIED	4	4	4	16
III	V-VI	ELECTIVE	3	5	4-5	13
IV	I-IV	SKILL BASED SUBJECT	6	2	2	12
IV	I	VALUE EDUCATION	1	2	2	2
IV	I	ENVIRONMENTAL STUDIES	1	2	2	2
IV	III, IV	NON MAJOR ELECTIVE	2	2	2	4
V	IV	EXTENSION ACTIVITY	1	0	1	1
	V	SELF – STUDY (SOFT SKILLS)	1	0	0	0
	VI	SELF –STUDY (G.K. (ONLINE))	1	0	0	0
<b>TOTAL</b>						<b>140</b>
<b>Any online courses in SWAYAM PORTAL</b>						



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4

### B.Sc. COMPUTER SCIENCE – COURSE STRUCTURE (CLOUD COMPUTING AND CYBER SECURITY) – II YEAR COURSE STRUCTURE – III – SEMESTER

S. No.	Course Code	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UACT31	<b>Part – I: Tamil –</b> காப்பியமும் நாடகமும்	6	3	25	75	100	3
	21UACH31	<b>Hindi – Hindi – III</b>						
	21UACS31	<b>Sanskrit – Sanskrit – III</b>						
2.	21UACE31	<b>Part – II: English –</b> English For Enrichment – III	6	3	25	75	100	3
3.	23UCDC31	<b>Part – III: Core – 5:</b> Data Structures and Computer Algorithms	3	3	25	75	100	4
4.	23UCDC32	<b>Part – III: Core – 6:</b> Data Communication and Computer Network	3	3	25	75	100	3
5.	23UCDCP3	<b>Part – III: Core – 7:</b> <b>Lab – V:</b> Data Structures and Computer Algorithms	4	3	40	60	100	3
6.	23UCDA31	<b>Part – III: Allied – 3:</b> Resource Management Techniques	4	3	25	75	100	2
7.	23UCDS31	<b>Part – IV: SBS – 3:</b> <b>Lab – VI:</b> Python Programming	2	3	40	60	100	2
8.	23UCDN31	<b>Part – IV: NME – 1:</b> Cloud Computing Fundamentals	2	3	25	75	100	2
TOTAL			30				700	22

### IV – SEMESTER

S. No.	Course Code	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UACT41	<b>Part – I: Tamil –</b> சங்க இலக்கியமும் அற இலக்கியமும்	6	3	25	75	100	3
	21UACH41	<b>Hindi – Hindi – IV</b>						
	21UACS41	<b>Sanskrit – Sanskrit – IV</b>						
2.	21UACE41	<b>Part – II: English –</b> English For Enrichment – IV	6	3	25	75	100	3
3.	23UCDC41	<b>Part – III: Core – 8:</b> Operating System	3	3	25	75	100	3
4.	23UCDC42	<b>Part – III: Core – 9:</b> Cloud Computing	3	3	25	75	100	4
5.	23UCDCP4	<b>Part – III: Core – 10:</b> <b>Lab – VII:</b> Advanced Java Programming	4	3	25	75	100	3
6.	23UCDA41	<b>Part – III: Allied – 4:</b> Numerical Methods	4	3	25	75	100	2
7.	23UCDS41	<b>Part – IV: SBS – 4:</b> <b>Lab – VIII:</b> Cloud Computing	2	3	40	60	100	2
8.	23UCDN41	<b>Part – IV: NME – 2:</b> Introduction to Cyber Crime and Cyber Law	2	3	25	75	100	2
9.		<b>Part – V:</b> Extension Activities	–	–	–	–	100	1
TOTAL			30				800	23

Passed in the BoS Meeting held on 09/03/2024

Signature of the Chairman



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5

### COURSE STRUCTURE – III SEMESTER

S. No.	Course Code	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UACT31	<b>Part – I: Tamil –</b> காப்பியமும் நாடகமும்	6	3	25	75	100	3
	21UACH31	<b>Hindi –</b> Hindi – III						
	21UACS31	<b>Sanskrit –</b> Sanskrit – III						
2.	21UACE31	<b>Part – II:</b> <b>English –</b> English For Enrichment – III	6	3	25	75	100	3
3.	23UCDC31	<b>Part – III: Core – 5:</b> Data Structures and Computer Algorithms	3	3	25	75	100	4
4.	23UCDC32	<b>Part – III: Core – 6:</b> Data Communication and Computer Network	3	3	25	75	100	3
5.	23UCDCP3	<b>Part – III: Core – 7:</b> <b>Lab –V:</b> Data Structures and Computer Algorithms	4	3	40	60	100	3
6.	23UCDA31	<b>Part – III: Allied – 3:</b> Resource Management Techniques	4	3	25	75	100	2
7.	23UCDS31	<b>Part – IV: SBS – 3:</b> <b>Lab – VI:</b> Python Programming	2	3	40	60	100	2
8.	23UCDN31	<b>Part – IV: NME – 1:</b> Cloud Computing Fundamentals	2	3	25	75	100	2
TOTAL			30				700	22

CA – Class Assessment (Internal)

SE – Summative Examination

SBS – Skill Based Subject

NME – Non –Major Elective

T – Theory

P – Practical

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6

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDC31	DATA STRUCTURES AND COMPUTER ALGORITHMS	CORE – 5	3	-	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
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### COURSE DESCRIPTION:

This course aims to impart fundamental knowledge on application of data structures in problem solving using several predefined algorithms.

### COURSE OBJECTIVES:

- To impart knowledge and skill on identifying apt data structures to solve problems efficiently.
- To impart skill to write time and space efficient algorithms.
- To give knowledge on the concepts and applications of (i) linear data structures viz., arrays, stacks, queues (ii) linked linear data structures viz., linked lists, linked stacks and linked queues and (iii) Non-linear data structures viz, trees, binary trees.
- To give knowledge on various sorting and searching algorithms.
- To impart knowledge on solving problems using algorithmic techniques viz., Divide and Conquer, Greedy Approach, Dynamic Programming and Backtracking

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	identify data structures needed to solve specific problems	Upto K3
CO 2	analyze the data structures for effective use in problem solving	Upto K3
CO 3	design and develop efficient algorithms in terms of space and time	Upto K3
CO 4	troubleshoot algorithms	Upto K3
CO 5	analyze time complexity of algorithms	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY





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7

### **DATA STRUCTURES AND COMPUTER ALGORITHMS**

#### **UNIT – I: INTRODUCTION AND OVERVIEW**

Introduction–Basic Terminology; Elementary Data Organization – Data Structure Operations – Complexity of Algorithms – Other Asymptotic Notations for Complexity of Algorithms. **Arrays** –Introduction–Linear Arrays–Representation– Linear Arrays in Memory –Traversing Linear Arrays – Inserting and Deleting – Multidimensional Arrays. **Linked List** – Introduction –Linked Lists – Representation of Linked Lists in Memory – Traversing a Linked List – Memory Allocation; Garbage Collection – Insertion into a Linked List – Deletion from a Linked list.

#### **UNIT – II: STACK**

Introduction–Stacks–Array Representation of Stacks–Linked Representation of Stacks – Recursion - Tower of Hanoi - Implementation of Recursive Procedures by Stacks - **Queue** –Linked Representation of Queues – De-Queue

#### **UNIT – III: TREES**

Introduction–Binary Trees–Representing Binary Trees in memory–Traversal Binary Tree – Traversal algorithms using Stacks – Header Nodes; Threads – Binary Search Trees – Searching and Inserting in Binary Search Trees– Deleting in a Binary Search Trees.

**Graphs** –Introduction–Graph Theory - Terminology–Sequential Representations of Graph– Adjacency Matrix; Path Matrix – Warshall's Algorithm; Shortest Paths.

#### **UNIT – IV: ALGORITHMS**

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 – V: THE GREEDY METHOD**

General Method–Knapsack problem–Job Sequencing with deadlines – Minimum cost spanning trees: Prim's Algorithm – Kruskal Algorithm – Optimal Storage on tapes – Optimal merge patterns – single source shortest path.



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8

### TEXT BOOKS:

1. Seymour Lipschutz, *Data Structures*, Revised First Edition, Schaum's Outlines, McGraw Hill Education, 2017.
2. Ellis Horowitz, Sartaj Sahni, *Fundamentals of Computer Algorithms*, Galgotia Publications Pvt. Ltd, New Delhi, Second Edition, 2008.

<b>Unit I</b>	<b>: Textbook 1</b>	Chapter 1 (1.1 to 1.4), Chapter 2 (2.5, 2.6), Chapter (4.1 to 4.9), Chapter 5 (5.1 to 5.8)
<b>Unit II</b>	<b>: Textbook 1</b>	Chapter 6 (6.1 to 6.4, 6.7 to 6.12)
<b>Unit III</b>	<b>: Textbook 1</b>	Chapter 7 (7.1 to 7.9)
<b>Unit IV</b>	<b>: Textbook 2</b>	Chapter 1 (Except 1.4), Chapter 3 (Except 3.2, 3.9)
<b>Unit V</b>	<b>: Textbook 2</b>	Chapter 4 (Except 4.2, 4.6.3)

### REFERENCE BOOKS:

1. *C and C++ Programming Concepts and Data Structures* - S. Subramanyam - BS Publications, 2013.
2. *Algorithm and Data Structures*, M.M. Raghuwanshi, Narosha Publishing House, 2016.
3. *Data Structures and Algorithms* - Alfred V. Aho, John E. Hopcraft and Jeffrey D. Ullman - Pearson Education - Fourteenth Impression - 2013.
4. *Data Structure and Algorithm Analysis in C* – Mark Allen Weiss – Second Edition, Addison Wesley publishing company, 1997.

### DIGITAL TOOLS:

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
<b>CO1</b>	<b>3</b>					
<b>CO2</b>		<b>2</b>	<b>1</b>			<b>3</b>
<b>CO3</b>	<b>3</b>					
<b>CO4</b>	<b>2</b>		<b>2</b>	<b>3</b>		<b>1</b>
<b>CO5</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>1</b>

3. Advanced Application 2. Intermediate Development 1. Introductory Level





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9

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDC32	DATA COMMUNICATION AND COMPUTER NETWORK	CORE – 6	3	-	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
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### COURSE DESCRIPTION:

This course enables the students to get introductory knowledge on Data Communications and networking. It familiarizes the students with the basics of data communications, OSI model, TCP/IP model and techniques. It also focuses on topologies, coding schemes, error control, flow control and the services of various layer and its protocols.

### COURSE OBJECTIVES:

- To teach various types of networking technology, network model.
- To impart knowledge on various issues of the different layers of OSI, TCP/IP model.
- To make the students understand the working of physical layer, datalink layer, network layer, transport layer and its services.
- To introduce the basic concepts of network security, security services.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model and understand various types of transmission media, network devices; and parameters of evaluation of performance for each media and device	Upto K3
CO 2	understand the concept of flow control, error control and LAN protocols; to explain the design of, and algorithms used in, the physical, data link layers.	Upto K3
CO 3	understand the concept of Network Layer function, routing algorithms and datagram service	Upto K3
CO 4	understand the functioning of transport layer, TCP protocol, connection establishment, congestion control and transport layer protocols	Upto K3
CO 5	understand the fundamental concept of network security, model of network security, security services and cryptography	Upto K3

K1- KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING, K3-APPLY



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10

### **DATA COMMUNICATION AND COMPUTER NETWORK**

#### **UNIT – I: INTRODUCTION**

A Brief History – Applications – Computer Networks–Categories of Networks – Standards and Standards Organizations – Network Architecture – Open Systems and OSI Model – TCP/IP Architecture. Communication Media and Data Transmission: Fourier Analysis–Analog and Digital Data Transmission – Modulation and Demodulation – Transmission Media – Wireless Communications – Data Transmission Basics – Transmission Mode – Interfacing– Multiplexing. Error Detection and Correction: Types of Errors – Error Detection – Error Correction. **Data Link Control and Protocol Concepts:** Flow Control–Error Control– Asynchronous Protocols – Synchronous Protocols – High-Level Data Link Control (HDLC).

#### **UNIT – II: LOCAL AREA NETWORKS**

Types of Networks and Topology – LAN Transmission Equipment – LAN Installation and Performance. **Ethernet:** IEEE Standard 802.3 Token Bus: IEEE Standard 802.4 Token Ring: IEEE Standard 802.5 – Fiber Distributed Data Interface (FDDI) – Distributed Queue Dual Bus (DQDB): IEEE Standard 802.6–LAN Operating Systems and Protocols – Ethernet Technologies. **Wide Area Networks:** WAN Transmission Methods–WAN Carrier Types–WAN Transmission Equipments – WAN Design and Multicast Considerations – WAN Protocols.

#### **UNIT – III: INTEGRATED SERVICES AND ROUTING PROTOCOLS**

Integrating Services–ISDN Services – ISDN Topology – ISDN Protocols – Broadband ISDN – Asynchronous Transfer Mode (ATM) – Principal Characteristics of ATM – Frame Relay – Comparison of ISDN, ATM and Frame Relay. **Wireless LANS:** WLAN Applications–Wireless LAN Requirements–Planning for Wireless LANs – Wireless LAN Architecture – IEEE 802.11 Protocol Layer – IEEE 802.11 Physical Layer – Designing the Wireless LAN Layout – WAP Services.

#### **UNIT – IV: INTERNET WORKING**

Principles of Internet Working–Routing Principles–Internetwork Protocols (IP) – Shortcomings of IPv4 – IP Next Generation. **TCP Reliable Transport Service:** Transport Protocols–The Service TCP Provides to Applications – End –to-End Service and Datagrams – Transmission Control Protocol – User Datagram Protocol.

#### **UNIT – V: NETWORK APPLICATIONS**

Client-Server Model–Domain Name System (DNS)–Telnet – File Transfer and Remote File access – Electronic Mail – World Wide Web (WWW). **Network Management:** Goal of Network Management–Network Management Standards – Network Management Model – Infrastructure for Network Management – Simple Network Management Protocol (SNMP).

**Passed in the BoS Meeting held on 09/03/2024**

**Signature of the Chairman**



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11

### TEXT BOOK:

*Data Communications and Computer Networks*, Brijendra Singh, Third Edition, PHI, 2011.

**Unit I** : Chapters 1,2,3,5

**Unit II** : Chapters 6, 7

**Unit III** : Chapters 8, 9

**Unit IV** : Chapters 10,11

**Unit V** : Chapter 12

### REFERENCE BOOKS:

1. Larry L. Peterson, Bruce S. Davie, *Computer Networks: A Systems Approach*, Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Nader. F. Mir, *Computer and Communication Networks*, Pearson Prentice Hall Publishers, 2010.
3. *Computer Networks*, Andrew S Tanenbaum, 4<sup>th</sup> Ed, Prentice Hall of India, 2006.
4. *Data Communications and Computer Networks*, Prakash C. Gupta, Prentice Hall of India,2005.
5. *Data and Computer Communications*, William Stallings, PHI, 2007.

### DIGITAL TOOLS (including moocs, Swayam, nptel):

1. <https://www.youtube.com/watch?v=iSS0uOSPv8Y&list=PL5B4lsKp6FVzTrpiBbKcv2AgOVzqtHJnp>
2. <https://www.digimat.in/nptel/courses/video/106105183/L01.html>
3. <https://www.youtube.com/watch?v=sG6WGvzmVaw&list=PL8BF3052396E05930>
4. <https://www.youtube.com/watch?v=pVI1L1jrbFE>
5. <https://csc-knu.github.io/sys-prog/books/Andrew%20S.%20Tanenbaum%20-%20Computer%20Networks.pdf>

### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	3	2	2	1
CO2	2	3	1	3	2	2
CO3	1	1	3	2	2	3
CO4	2	2	2	2	2	3
CO5	2	2	1	1	2	1

3. Advanced Application    2. Intermediate Development    1. Introductory Level



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12

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDCP3	LAB: DATA STRUCTURES AND COMPUTER ALGORITHMS	CORE – 7 LAB – V	-	4	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	40	60	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input checked="" type="checkbox"/>
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### COURSE DESCRIPTION:

The course is designed to develop skills to design and analyze simple linear and non-linear data structures. It strengthens the ability to the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

### COURSE OBJECTIVES:

At the end of this lab session, the student will be able to design and analyze the time and space efficiency of the data structure. Be capable to identify the appropriate data structure for given problem. Have practical knowledge on the applications of data structures.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand to use the basic concepts and principles of various types of linked lists	Upto K3
CO 2	understand the concepts of stack and queue practically.	Upto K3
CO 3	understand the concepts and apply the methods in basic trees.	Upto K3
CO 4	understand the concepts and apply the methods in graphs.	Upto K3
CO 5	understand the concepts and apply the techniques in searching	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# **SOURASHTRA COLLEGE, MADURAI – 625004**

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS**

**(Under CBCS based on OBE)(with effect from 2023 – 2024)**

13

### **LAB : DATA STRUCTURES AND COMPUTER ALGORITHMS**

#### **SECTION – A**

**(Programs from Data Structures Using C)**

1. Write a program in "C" to implement Stack as an array.
2. Write a program in "C" to implement Stack as a linked list.
3. Write a program in "C" to convert the Infix expression to Postfix expression using stack.
4. Write a program in "C" to convert Infix expression to Prefix expression using Stack.
5. Write a program in "C" to implement Queue as an Array.
6. Write a program in "C" to implement Queue as a linked list.
7. Write a program in "C" to implement Binary tree traversals.
8. Write a program in "C" to implement Binary Search Tree.

#### **SECTION – B**

**(Programs from Data Structures Using C++)**

1. Write a program in "C++" to perform Bubble Sort
2. Write a program in "C++" to perform Insertion Sort
3. Write a program in "C++" to perform Merge Sort
4. Write a program in "C++" to perform Quick Sort
5. Write a program in "C++" to perform Selection Sort
6. Write a program in "C++" to perform Linear Search
7. Write a program in "C++" to perform Binary Search
8. Write a menu driven program in "C++" to insert data in circular queue and display the queue
9. Write a program in "C++" to insert data in a binary search tree and display as in order, preorder and post order

#### **REFERENCE BOOK:**

*C and C++ Programming Concepts and Data Structures*, P. S. Subramanyam, BS Publications, 2013.



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## B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS

(Under CBCS based on OBE)(with effect from 2023 – 2024)

14

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDA31	RESOURCE MANAGEMENT TECHNIQUES	ALLIED – 3	4	-	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability <input type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
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### COURSE DESCRIPTION:

This course is designed to teach various concepts of Operation Research to the students.

### COURSE OBJECTIVES:

- To explain the brief history of Operation Research.
- To explain how to formulate the general Linear Programming Problem and solve by Graphical method.
- To explain the algorithm and method to solve Simplex and Big– M method.
- To explain the Hungarian algorithm and method to solve Assignment problems.
- To explain and Solve the various methods in Transportation problems.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	state the history of Operations Research	Upto K3
CO 2	describe Linear Programming Problem, Mathematical formulation of LPP and Solve the LPP by using Graphical method	Upto K3
CO 3	solve LPP by Simplex method and Big – M method	Upto K3
CO 4	understand Duality theorem and demonstrate solution procedure for assignment Problem.	Upto K3
CO 5	demonstrate and solve Travelling Salesman problem	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY





# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS**

**(Under CBCS based on OBE)(with effect from 2023 – 2024)**

15

### RESOURCE MANAGEMENT TECHNIQUES

#### UNIT – I:

Development of OR: Definition of OR–Modeling - Characteristics and Phases - Tools, Techniques & Methods - scope of OR.

#### UNIT – II:

Linear Programming Problem: Formulation - Slack & surplus variables - Graphical solution of LPP.

#### UNIT – III:

Simplex Method: Computational Procedure - Big-M method - Concept of duality in LPP - Definition of primal dual problems - General rules for converting any primal into its dual.

#### UNIT – IV:

Duality Theorems: (without proof) Primal dual correspondence - Duality and Simplex method - Mathematical formulation of assignment problem - Method for solving assignment problem.

#### UNIT – V:

Mathematical formulation of Transportation Problem: Methods for finding IBFS for the Transportation Problems.

#### TEXT BOOK:

*Operations Research*, S.D. Sharma, Publisher KedarNath, Ram Nath & Co.

**Unit I:** Chapter-1(1.1, 1.2, 1.4, 1.5, 1.8, 1.9, 1.10, 1.11)

**Unit II:** Chapter-3 (3.1, 3.2, 3.3, 3.3.1, 3.3.2, 3.3.3, 3.3.4, 3.4, 3.5)

**Unit III:** Chapter-5 (5.1, 5.2, 5.2.1, 5.3, 5.4, 5.5.4) Chapter- 7 (7.1, 7.2, 7.3, 7.4)

**Unit IV:** Chapter-7 (7.5) (Statements only); 7.6, 7.7 Chapter 11(11.2, 11.3, 11.4)

**Unit V:** Chapter-12 (12.2 to 12.8)

#### REFERENCE BOOKS:

1. *Operation Research*, Nita H. Shah, Ravi M.Gor and Hardiksoni, Prentice Hall of India Pvt. Ltd., New Delhi 2008.
2. *Operation Research*, R. Sivarethinamohan, Tata McGraw Hill, 2005.
3. *Operations Research – An Introduction* by Hamdy A.Taha. Ninth Edition, Dorling Kindersley Pvt. Ltd., Noida, India, 2012.

#### **Mapping of CO with PSO**

CO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	1	1	1
CO2	1	2	2	1	1	2
CO3	1	2	2	1	1	2
CO4	1	2	2	1	1	1
CO5	1	2	2	1	1	1

3. Advanced Application    2. Intermediate Development    1. Introductory Level



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## B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS

(Under CBCS based on OBE)(with effect from 2023 – 2024)

16

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDS31	LAB: PYTHON PROGRAMMING	SBS – 3 LAB – VI	-	2	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	40	60	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input checked="" type="checkbox"/>

### COURSE DESCRIPTION:

Python is highly versatile. You can use it for both small and complex tasks, and it is used across many different industries – from its more common applications in data science and software engineering to environments like mobile app development, artificial intelligence, and machine learning.

### COURSE OBJECTIVES:

To deal with Programming using PYTHON in the following areas

- Data science.
- Scientific and mathematical computing.
- Web development.
- Finance and trading.
- System automation
- Computer graphics.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO1	learn simple programs using formulas	Upto K3
CO2	learn simple programs to solve mathematical problems	Upto K3
CO3	learn python programs to play simple games	Upto K3
CO4	learn python programs to solve simple problems related to Computer graphics	Upto K3
CO5	learn python programs to solve simple problems related to Data Science	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# **SOURASHTRA COLLEGE, MADURAI – 625004**

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS**

**(Under CBCS based on OBE)(with effect from 2023 – 2024)**

17

### **PYTHON PROGRAMMING LAB**

1. Program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. Program to calculate total marks, percentage and grade of a student. Marks obtained in each of the five subjects are to be input by user. Assign grades according to the following criteria: Grade A: Percentage  $\geq 80$  Grade B: Percentage  $\geq 70$  and  $< 80$  Grade C: Percentage  $\geq 60$  and  $< 70$  Grade D: Percentage  $\geq 40$  and  $< 60$  Grade E: Percentage  $< 40$
3. Program, to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user
4. Program to display the first n terms of Fibonacci series.
5. Program to find factorial of the given number using recursive function.
6. Write a Python program to count the number of even and odd numbers from array of N numbers.
7. Python function that accepts a string and calculate the number of uppercase letters and lower-case letters
8. Python program to reverse a given string and check whether the given string is palindrome or not.
9. Write a program to find sum of all items in a dictionary.
10. Write a Python program to construct the following pattern, using a nested loop  
1  
22  
333  
4444  
55555
11. Read a file content and copy only the contents at odd lines into a new file. Create a Turtle graphics window with specific size.
12. Write a Python program for Towers of Hanoi using recursion
13. Create a menu driven Python program with a dictionary for words and their meanings. Devise a Python program to implement the Hangman Game.
14. A website requires the users to input username and password to register. Write a program to check the validity of password input by users.  
Following are the criteria for checking the password:
  - a) At least 1 letter between [a-z]
  - b) At least 1 number between [0-9]
  - c) At least 1 letter between [A-Z]
  - d) At least 1 character from [!@#]
  - e) Minimum length of transaction password: 6Your program should accept a sequence of comma separated passwords and will check them according to the above criteria. Passwords that match the criteria are to be printed, each separated by a comma.



# **SOURASHTRA COLLEGE, MADURAI – 625004**

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS**

**(Under CBCS based on OBE)(with effect from 2023 – 2024)**

18

### **REFERENCE BOOKS:**

1. *Python Programming a Modular Approach with Graphics, Database, Mobile, and Web Applications* – Sheetal Taneja, Naveen Kumar – Pearson Publication, 2018.
2. *Problem Solving and Python Programming* – S.A.Kulkarni, Yesdee Publisher, 2017.
3. Charles Dierbach, *Introduction to Computer Science using Python - A Computational Problem solving Focus*, Wiley India Edition, 2015.



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS

(Under CBCS based on OBE)(with effect from 2023 – 2024)

19

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDN31	CLOUD COMPUTING FUNDAMENTALS	NME	2		2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	III	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

### COURSE DESCRIPTION:

This course provides a comprehensive overview of cloud computing, covering fundamental concepts, technologies, and services. Students will explore various cloud models, services, and applications, gaining insight into the deployment, management, and security aspects of cloud environments. Additionally, the course examines the application of cloud computing in different sectors such as industry, healthcare, transportation systems, and education.

### COURSE OBJECTIVES:

- To provide students with the fundamentals and essentials of Cloud Computing.
- To explore cloud concepts and technologies including virtualization, load balancing, scalability, and monitoring.
- To analyze the security considerations and best practices in cloud computing.
- To evaluate the application of cloud computing in various industries including healthcare, transportation, manufacturing, and education.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	explain the core concepts of the cloud computing paradigm and Compare and contrast different cloud models and services.	Upto K3
CO 2	explain cloud concepts and technologies such as virtualization, load balancing, and software-defined networking.	Upto K3
CO 3	demonstrate an understanding of cloud deployment and management techniques.	Upto K3
CO 4	identify common security challenges in cloud computing and implement appropriate security measures.	Upto K3
CO 5	evaluate the potential benefits and challenges of adopting cloud computing in different industries.	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS

(Under CBCS based on OBE)(with effect from 2023 – 2024)

20

### CLOUD COMPUTING FUNDAMENTALS

#### UNIT I:

**Cloud Introduction – Introduction** - Cloud computing definition - Characteristics – Cloud Models – Cloud services – Cloud- based Services & Applications.

#### UNIT II:

**Cloud Concepts & Technologies:** Virtualization – Load balancing – Scalability & Elasticity – Deployment – Replication – Monitoring – Software Defined Networking – Network Function Virtualization – MapReduce – Identity and Access Management – Service level agreement – Billing.

#### UNIT III:

**Cloud Services & Platforms** – Compute service – Storage services – Database Services – Application Services – Content Delivery Services – Analytics Services – Deployment & Management Services – Identity & Access Management Services – Open Source Private Cloud Software.

#### UNIT IV:

**Cloud Security** – Introduction – CSA Cloud security Architecture 0 Authentication – Authorization – Data Security – Key management – Auditing.

#### UNIT V:

**Cloud for Industry, Healthcare & Education** – Cloud computing for Healthcare - Cloud computing for Transportation systems - Cloud computing for Manufacturing Industry - Cloud computing for Education.

#### TEXT BOOK:

Arshdeep Bahga, Vijay Madiseti, “**Cloud Computing – A Hands-On Approach**”, University Press, 2014.

Unit I :	Chapter 1	Unit II :	Chapter 2
Unit III:	Chapter 3	Unit IV:	Chapter 12
Unit V :	Chapter 13		

#### REFERENCE BOOKS:

1. Barrie Sosinsky, *Cloud Computing Bible*, Wiley Publishing, 2011.
2. Ray Rafaels, *Cloud Computing: From Beginning to End*, CreateSpace Independent Publishing Platform, 2015.
3. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, *Cloud Computing – A Practical Approach*, TMH, 2010.

#### DIGITAL TOOLS:

- [https://onlinecourses.nptel.ac.in/noc21\\_cs14/preview](https://onlinecourses.nptel.ac.in/noc21_cs14/preview)
- [https://www.tutorialspoint.com/cloud\\_computing/cloud\\_computing\\_tutorial.pdf](https://www.tutorialspoint.com/cloud_computing/cloud_computing_tutorial.pdf)
- [https://terrogum.com/tfox/books/cloudcomputingbasics\\_asefiteachingintroduction.pdf](https://terrogum.com/tfox/books/cloudcomputingbasics_asefiteachingintroduction.pdf)

#### **Mapping of CO with PSO**

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	1		1		1
CO2	2	1	1			1
CO3	1			1	1	
CO4	1	1	1			
CO5	2	2	2	2	2	2

3. Advanced Application 2. Intermediate Development 1. Introductory Level

**COURSE DESIGNER: Dr. K. ANURATHA**

Passed in the BoS Meeting held on 09/03/2024

Signature of the Chairman





# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS

(Under CBCS based on OBE)(with effect from 2023 – 2024)

21

### COURSE STRUCTURE – IV SEMESTER

S. No.	Course Code	Course Title	Hrs. / Week	Exam (Hrs.)	CA	SE	Total Marks	Credits
1.	21UACT41	<b>Part – I: Tamil –</b> சங்க இலக்கியமும் அற இலக்கியமும்	6	3	25	75	100	3
	21UACH41	<b>Hindi – Hindi – IV</b>						
	21UACS41	<b>Sanskrit –</b> Sanskrit – IV						
2.	21UACE41	<b>Part – II: English –</b> English For Enrichment – IV	6	3	25	75	100	3
3.	23UCDC41	<b>Part – III: Core – 8:</b> Operating System	3	3	25	75	100	3
4.	23UCDC42	<b>Part – III: Core – 9:</b> Cloud Computing	3	3	25	75	100	4
5.	23UCDCP4	<b>Part – III: Core – 10:</b> <b>Lab – VII:</b> Advanced Java Programming	4	3	25	75	100	3
6.	23UCDA41	<b>Part – III: Allied – 4:</b> Numerical Methods	4	3	25	75	100	2
7.	23UCDS41	<b>Part – IV: SBS – 4:</b> <b>Lab – VIII:</b> Cloud Computing	2	3	40	60	100	2
8.	23UCDN41	<b>Part – IV: NME – 2:</b> Introduction to Cyber Crime and Cyber Law	2	3	25	75	100	2
9.		<b>Part – V:</b> Extension Activities	–	–	–	–	100	1
		<b>TOTAL</b>	<b>30</b>				<b>800</b>	<b>23</b>

CA – Class Assessment (Internal)

SE – Summative Examination

SBS – Skill Based Subject

NME – Non –Major Elective

T – Theory

P – Practical

Passed in the BoS Meeting held on 09/03/2024

Signature of the Chairman



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## B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS

(Under CBCS based on OBE)(with effect from 2023 – 2024)

22

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDC41	OPERATING SYSTEM	CORE – 8	3	-	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input checked="" type="checkbox"/>
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### COURSE DESCRIPTION:

This course enables the students to get knowledge on the Operating system Concepts. This course also facilitates the students to understand the basic concepts of Android Operating system.

### COURSE OBJECTIVES:

- To give knowledge on the various concepts of Operating systems.
- To impart knowledge on Deadlock, Processor scheduling, Memory management and disk scheduling.
- To introduce the basic concepts of Android operating system.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	understand the fundamentals of Operating systems and process and processor scheduling concepts	Upto K3
CO 2	understand the fundamentals and problems of Asynchronous concurrent execution processes	Upto K3
CO 3	understand the problem of Deadlock and deadlock recovery	Upto K3
CO 4	understand the fundamentals of real and virtual memory concepts	Upto K3
CO 5	understand the fundamentals disk organization and file managements	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



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(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS**

**(Under CBCS based on OBE)(with effect from 2023 – 2024)**

23

### OPERATING SYSTEM

#### UNIT – I:

**Introduction to Operating Systems:** Introduction, What is an Operating system, Operating system components and goals, Operating systems architecture. **Process Concepts:** Introduction, Process States, Process Management, Interrupts, Inter process Communication.

#### UNIT – II:

**Asynchronous Concurrent Execution:** Introduction, Mutual Exclusion, Implementing Mutual Exclusion Primitives, Software solutions to the Mutual Exclusion Problem, Hardware solution to the Mutual Exclusion Problem, Semaphores. **Concurrent Programming:** Introduction, Monitors.

#### UNIT – III:

**Deadlock and Indefinite Postponement:** Introduction, Examples of Deadlock, Related Problem Indefinite Postponement, Resource concepts, Four Necessary conditions for Deadlock, Deadlock solution, Deadlock Prevention, Deadlock Avoidance with Dijkstra's Banker's algorithm, Deadlock Detection, Deadlock Recovery.

**Processor Scheduling:** Introduction, Scheduling levels, Preemptive Vs. Non- Preemptive Scheduling Priorities, Scheduling objective, Scheduling criteria, Scheduling algorithms.

#### UNIT – IV:

**Real Memory Organization and Management:** Introduction, Memory organization, Memory Management, Memory Hierarchy, Memory Management Strategies, Contiguous vs. Non-Contiguous Memory allocation, Fixed Partition Multi programming, Variable Partition multiprogramming.

**Virtual Memory Management:** Introduction, Page Replacement, Page Replacement Strategies, Page Fault Frequency (PFF) Page replacement, Page Release, Page Size.

#### UNIT – V:

**Disk Performance Optimization:** Introduction, Why Disk Scheduling is necessary, Disk Scheduling strategies, Rotational optimization.

**File and Database Systems:** Introduction, Data Hierarchy, Files, File Systems, File Organization, File Allocation, Free Space Management, File Access control.

#### TEXT BOOK:

*Operating Systems*, Deitel & Deitel Choffnes, Pearson education, Third edition, 2008.

**Unit – I:** Chapter 1: 1.1, 1.2, 1.12, 1.13 & Chapter 3: 3.1, 3.2, 3.3, 3.4, 3.5

**Unit – II:** Chapter 5: 5.1, 5.2, 5.3, 5.4(up to 5.4.2), 5.5, 5.6 & Chapter 6: 6.1, 6.2

**Unit – III:** Chapter 7: 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10  
Chapter 8: 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7

**Unit – IV:** Chapter 9: 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.8, 9.9  
Chapter 11: 11.1, 11.5, 11.6, 11.8, 11.9, 11.10

**Unit – V:** Chapter 12: 12.1, 12.4, 12.5, 12.6  
Chapter 13: 13.1, 13.2, 13.3, 13.4, 13.5, 13.6, 13.7, 13.8



# SOURASHTRA COLLEGE, MADURAI – 625004

(An Autonomous Institution Re-accredited with 'B+' grade by NAAC)

## **B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS**

(Under CBCS based on OBE)(with effect from 2023 – 2024)

24

### REFERENCE BOOKS:

1. *An Introduction to Operating Systems Concepts and Practice*, Pramod Chandra P. Bhatt, PHI, Second Edition, 2008.
2. *Operating System Concepts*, Abraham Silberschatz Peter Galvin Greg Gagne, 6th edition Windows XP Update, Wiley India edition, 2007.
3. *Operating Systems Principles and Design*, Pal Choudhury, PHI Learning, 2011.
4. *Operating Systems, A Concept Based Approach*, Dhananjay M. Dhamdhare Tata McGraw- Hill.

### DIGITAL TOOLS:

1. <https://data-notes.co/the-10-operating-system-concepts-software-developers-need-to-remember-480d0734d710>
2. [https://www.tutorialspoint.com/operating\\_system/index.htm](https://www.tutorialspoint.com/operating_system/index.htm)

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	3	2	2	2	1
CO2	2	3	3	3	2	2
CO3	2	3	3	2	2	3
CO4	2	2	2	2	2	3
CO5	2	2	1	1	2	1

3. Advanced Application    2. Intermediate Development    1. Introductory Level



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## B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS

(Under CBCS based on OBE)(with effect from 2023 – 2024)

25

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDC42	CLOUD COMPUTING	CORE – 9	3	-	4

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
I	IV	25	75	100

NATURE OF COURSE	Employability	Skill Oriented	Entrepreneurship
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

### COURSE DESCRIPTION:

This course is intended to provide knowledge necessary to classify and design various architectures of cloud computing. Also enhances the practical applications of cloud computing.

### COURSE OBJECTIVES:

#### To help the students

- classify the various Cloud computing applications.
- understand the architectures of cloud computing.
- understand the basic knowledge of cloud security.

### COURSE OUTCOMES (COs):

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

No	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO1	understand the history and Basic knowledge of Cloud computing.	Upto K3
CO2	understand different architectures of cloud computing such as Software as a Service (SaaS) – Infrastructure as a Service (IaaS) - Platform as a Service (PaaS)	Upto K3
CO3	describe about applications of cloud computing by using case studies	Upto K3
CO4	understand about cloud data centers and CRM management	Upto K3
CO5	understand security threats and solution in clouds	Upto K3

K1- KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING, K3-APPLICATION



# SOURASHTRA COLLEGE, MADURAI – 625004

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## B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS

(Under CBCS based on OBE)(with effect from 2023 – 2024)

26

### CLOUD COMPUTING

#### UNIT – I: CLOUD COMPUTING FOUNDATION

Introduction to Cloud Computing–Move to Cloud Computing–Types of Cloud –Working of Cloud Computing

#### UNIT – II: CLOUD COMPUTING ARCHITECTURE

Cloud Computing Technology–Cloud Architecture– Cloud Modeling and Design

**Virtualization:** Foundation –Grid, Cloud and Virtualization – Virtualization and Cloud Computing

#### UNIT – III: DATA STORAGE AND CLOUD COMPUTING

Data Storage–Cloud Storage–Cloud Storage from LANs to WANs –Cloud Computing Services: Cloud Services –Cloud Computing at Work

#### UNIT – IV: CLOUD COMPUTING AND SECURITY

Risks in Cloud Computing–Data Security in Cloud– Cloud Security Services –Cloud Computing Tools: Tools and Technologies for Cloud – Cloud Mashaps–Apache Hadoop – Cloud Tools

#### UNIT – V: CLOUD APPLICATIONS

Moving Applications to the Cloud –Microsoft Cloud Services – Google Cloud Applications –Amazon Cloud Services –Cloud Applications

#### TEXT BOOK:

A.Srinivasan and J.Suresh, *Cloud Computing –A Practical Approach for Learning and Implementation*, Pearson India Publications2014.

#### REFERENCE BOOKS:

1. RajkumarBuyya, James Broberg, Andrzej, *Cloud Computing: Principles and Paradigms*, Wiley India Publications 2011.
2. ArshdeepBahga and Vijay Madiseti, *Cloud Computing –A Hands on Approach*, Universities Press (India) Pvt Ltd. 2014.

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	1	2	2	2	1	1
CO2	2	2	1	2	2	2
CO3	3	2	1	2	2	2
CO4	2	3	2	2	1	1
CO5	2	2	2	2	2	1

3. Advanced Application    2. Intermediate Development    1. Introductory Level





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## B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS

(Under CBCS based on OBE)(with effect from 2023 – 2024)

27

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDCP4	LAB: ADVANCED JAVA PROGRAMMING	CORE -10 LAB – VII	-	4	3

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	40	60	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input checked="" type="checkbox"/>

### COURSE DESCRIPTION:

This course continues effective hands-on instruction in the Java object-oriented, high-level programming language. Topics may include advanced array manipulation, object-oriented design solutions, exception handling, manipulating files and databases, Swing and graphical user interfaces, multimedia based programming, and Applets.

### COURSE OBJECTIVES:

- To make the students learn Designing and developing Web applications
- To make the students design Enterprise based applications by encapsulating an application's business logic.
- To make the students design applications using pre-built frameworks.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	design window based applications.	Upto K3
CO 2	create a client and server communication using net package	Upto K3
CO 3	design reusable software components using java beans	Upto K3
CO 4	develop server side programming	Upto K3
CO 5	develop the dynamic web pages using JSP	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



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**(Under CBCS based on OBE)(with effect from 2023 – 2024)**

28

### **LAB : ADVANCED JAVA PROGRAMMING**

1. Program to display life cycle of an applet
2. Program to display digital clock using applet
3. Program to display different graphical shapes in applet
4. Program to display graphical bar chart by passing parameters in applet
5. Write an Applet which will play two sound notes in a sequence continuously use the play () methods available in the applet class and the methods in the Audio clip interface.
6. Program to find factorial value of N using AWT high level event handling
7. Program to illustrate window closing using AWT low level event handling
8. Program to illustrate TCP based network communication
9. Program to illustrate UDP based network communication
10. Program to find sum of digits using RMI
11. Program to find length of the given string using RMI
12. Write a program in Java to implement a Client/Server application using RMI.
13. Program using HTML/Java script to find length of the given string
14. Program using HTML/Java script to find biggest element of an array
15. Program to compute factorial value of N using Generic Servlet
16. Program to compute factorial value of N using HTTP Servlet
17. Use JDBC connectivity and create Table, insert and update data.
18. Write a program in Java to create a Cookie and set the expiry time of the same.
19. Write a program in Java to create Servlet to count the number of visitors to a webpage.
20. Write a program in Java to create a form and validate a password using Servlet.
21. Develop a Java Bean to demonstrate the use of the same.
22. Write a program in Java to convert an image in RGB to a Grayscale image.
23. Develop Chat Server using Java.

### **REFERENCE BOOKS:**

1. *Java The Complete Reference* - Herbert Schildt, McGraw Hill Education, 10th Edition, New York, 2017.
2. *Programming in Java* – Sachin Malhotra, Saurabh Choudhary, Oxford University Press, Revised Second Edition.



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(Under CBCS based on OBE)(with effect from 2023 – 2024)

29

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDA41	NUMERICAL METHODS	ALLIED – 4	4	-	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability <input type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
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### COURSE DESCRIPTION:

To explore complex systems, physicists, engineers, financiers and mathematicians require computational methods since mathematical models are only rarely solvable algebraically. Numerical methods, based upon sound computational mathematics, are the basic algorithms underpinning computer predictions in modern systems science.

### COURSE OBJECTIVES:

To develop ability to use algorithms for approximation problem like (i) systems of linear equations, linear least squares problems, and eigenvalue calculation; (ii) interpolation, approximation, and integration of functions; (iii) initial values problems governed by ordinary differential equations; (iv) nonlinear scalar equations.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems	Upto K3
CO 2	apply numerical methods to obtain approximate solutions to mathematical problems.	Upto K3
CO 3	analyse and evaluate the accuracy of common numerical methods.	Upto K3
CO 4	derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations.	Upto K3
CO 5	assess the approximation techniques to formulate and apply appropriate strategy to solve real world problems	Upto K3

K1- KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING, K3-APPLY



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(Under CBCS based on OBE)(with effect from 2023 – 2024)

30

### NUMERICAL METHODS

#### UNIT – I:

Algebraic and Transcendental Equations: Errors in numerical computation-Iteration method-Bisection method-Regula-Falsi method-Newton-Raphson method-Horner's method.

#### UNIT – II:

Simultaneous Equations: Introduction-Simultaneous equations-Back substitution- Gauss Elimination method-Gauss –Jordan Elimination method-Calculation of Inverse of a matrix-Crout's method-Iterative methods-Gauss-Jacobi Iteration method-Gauss seidal Iteration method-Newton Raphson's method for simultaneous equations.

#### UNIT – III:

Interpolation & Introduction: Newton's interpolation Formulae-Central difference Interpolation formulae-Gauss forward, Gauss backward, Lagrange's interpolation formulae-Divided differences-Newton's divided difference formula-Inverse Interpolation.

#### UNIT – IV:

Numerical Differentiation and Integration: Introduction-Derivates using Newton's forward difference formula-Derivates using Newton's backward difference formula- Numerical Integration-Newton-cotes quadrature formula-Trapezoidal Rule-Simpson's one third rule-Simpson's 3/8 th rule.

#### UNIT – V:

Numerical Solution of Ordinary Differential Equations: Introduction-Taylor series method-Picard's method-Euler's method-Runge-kutta method of second, third, fourth order- Predictor & corrector methods-Mile's method.

#### TEXT BOOK:

*Numerical Methods*, Second Edition, S. Arumugam, A. Thangapandi Issac, A. Somasundaram, SCITECH publications, 2009.

**Unit I:** Chapter-3

**Unit II:** Chapter-4 (excluding Relation method and its related problems)

**Unit III:** Chapter-7 (Sections: 7.0, 7.1, 7.2((i), (ii) and related problems); 7.3, 7.4, 7.5,7.6

**Unit IV:** Chapter-8 (Sections: 8.0, 8.1, 8.2 related problems, 8.5

(excluding Weddles rule, Booles rule, Romberg's method and related problems))

**Unit V:** Chapter-10 (Sections: 10.0, 10.1, 10.2, 10.3

(excluding modified Euler's method & its

related problems) 10.4, 10.5, 10.6)

#### REFERENCE BOOKS:

1. Mathews J.H. *Numerical Method for Maths, Science and Engineering*. PHI, New Delhi, 2001.
2. Iqbal H. Khan & Q. Hassan. *Numerical Methods for Engineers and Scientist* - Galgotia Publications (P) Ltd., New Delhi - 1997.
3. M.K. Jain, S.R.K. Iyengar & R.K. Jain - *Numerical Methods for Scientific and Engineering Computation* - New Age International(P) Ltd., New Delhi – 1996.



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(Under CBCS based on OBE)(with effect from 2023 – 2024)

31

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDS41	LAB: CLOUD COMPUTING LAB	SBS – 4 LAB – VIII	-	2	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	40	60	100

NATURE OF COURSE	Employability <input checked="" type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input checked="" type="checkbox"/>

### COURSE DESCRIPTION:

This course gives the demonstration of various lab programs involved in Cloud computing lab. In this course, students are going to see the demonstration of virtual machine creation, installing and executing any software and its related applications in virtual machines, adding virtual block to virtual machine, installing C compiler and executing a sample C program in virtual machine.

### COURSE OBJECTIVES:

- To install the virtual box/VMware.
- To develop web applications in cloud.
- To learn design and development process involved in creating a cloud-based application.
- To transfer files from one virtual machine to another.
- To learn to implement and use parallel programming using Hadoop.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	configure various virtualization tools such as Virtual Box, VMware workstation.	Upto K3
CO 2	use of Google App Engine.	Upto K3
CO 3	GAE launcher to launch the web applications.	Upto K3
CO 4	simulate a cloud scenario using CloudSim and run a scheduling algorithm.	Upto K3
CO 5	transfer the files from one virtual machine to another virtual machine	Upto K3

K1– KNOWLEDGE (REMEMBERING), K2–UNDERSTANDING, K3–APPLY



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## **B.Sc. COMPUTER SCIENCE (CLOUD COMPUTING AND CYBER SECURITY) – SYLLABUS**

**(Under CBCS based on OBE)(with effect from 2023 – 2024)**

32

### **LAB: CLOUD COMPUTING**

#### **SECTION – A**

1. Write a C program that contains a string (char pointer) with a value "Hello World". The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value "Hello World". The program should AND or and XOR each character in this string with 127 and display the result
3. Write a Java program to perform encryption and decryption using the following algorithms: a) Ceaser Cipher b) Substitution Cipher c) Hill Cipher
4. Write a Java program to implement the DES algorithm logic
5. Write a C/JAVA program to implement the BlowFish algorithm logic Write a C/JAVA program to implement the Rijndael algorithm logic.
6. Using Java Cryptography, encrypt the text "Hello world" using BlowFish. Create your own key using Java keytool.
7. Write a Java program to implement RSA Algorithm
8. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript. Consider the end user as one of the parties (Alice) and the JavaScript application as other party (bob).
9. Calculate the message digest of a text using the SHA-1 algorithm in JAVA. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

#### **SECTION – B**

1. Install Virtual box/VMware Workstation with different flavours of linux or windows OS on top of windows 7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in Cloud Sim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine. Find a procedure to launch virtual machine using try stack (Online Open stack Demo Version) Install Ha doop single node cluster and run simple applications like word count.

#### **REFERENCE BOOK:**

A. Srinivasan and J. Suresh, *Cloud Computing – A Practical Approach for Learning and Implementation*, Pearson India Publications 2014.





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(Under CBCS based on OBE)(with effect from 2023 – 2024)

33

COURSE CODE	COURSE TITLE	CATEGORY	T	P	CREDITS
23UCDN41	INTRODUCTION TO CYBER CRIME AND CYBER LAW	NME – 2	2	-	2

YEAR	SEMESTER	INTERNAL	EXTERNAL	TOTAL
II	IV	25	75	100

NATURE OF COURSE	Employability <input type="checkbox"/>	Skill Oriented <input checked="" type="checkbox"/>	Entrepreneurship <input type="checkbox"/>
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### COURSE DESCRIPTION:

This course aims to provide students with a holistic understanding of cybercrime and cyber law, preparing them to tackle challenges in the ever-evolving landscape of information security and digital governance.

### COURSE OBJECTIVES:

- To learn the fundamentals of cyber-crime.
- To understand various types of cyber-crimes.
- To enable students with security challenges in mobile and wireless devices.
- To study the significance of cyber laws and different acts.

### COURSE OUTCOMES (COs):

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

No.	Course Outcomes	Knowledge Level (According to Bloom's Taxonomy)
CO 1	equip with a comprehensive understanding of cybercrime, its various forms.	Upto K3
CO 2	will gain an understanding of various cyber offenses, including social engineering, cyber stalking.	Upto K3
CO 3	able to analyze security risks associated with mobile and wireless devices.	Upto K3
CO 4	develop strategies to mitigate these risks within organizational settings.	Upto K3
CO 5	possess knowledge of cyber laws and ethical considerations surrounding emerging technologies.	Upto K3

K1- KNOWLEDGE (REMEMBERING), K2-UNDERSTANDING, K3-APPLY



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(Under CBCS based on OBE)(with effect from 2023 – 2024)

34

### INTRODUCTION TO CYBER CRIME AND CYBER LAW

#### UNIT I: INTRODUCTION TO CYBERCRIME

Introduction – Cybercrime: definition and origins of the word – cybercrime and information security – who are cybercriminals – classification of cybercrimes.

#### UNIT II: CYBER OFFENSES

Introduction – how criminals plan the attacks – social engineering – cyber stalking – cybercafé and cybercrimes – botnets: the fuel for cybercrime – attack vector.

#### UNIT III: CYBERCRIME: MOBILE AND WIRELESS DEVICES

Introduction – proliferation of mobile and wireless devices – Trends in mobility – credit card frauds in mobile and wireless computing era – security challenges posed by mobile devices – registry settings for mobile devices – authentication service security – attacks on mobile/cell phones.

#### UNIT IV: MOBILE DEVICES

Security implications for organizations – organizational measures for handling mobile devices-related security issues –organizational security policies and measures in mobile computing era – Laptop

#### UNIT V: CYBER LAW

Cybercrime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cybercrime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies.

#### TEXT BOOK:

Nina Godbole, Sunit Belapure, *Cyber Security– Understanding Cybercrimes, Computer Forensics and Legal Perspectives*, Wiley-India, New Delhi,2011.

#### REFERENCE BOOKS:

- Jonathan Clough, *Principles of Cybercrime*, 2<sup>nd</sup> Edition, Cambridge University Press, UK, 2015.
- Bernadete H Schell and Clemens Martin, *Cybercrime – A Reference Handbook*, ABC-CLIO, Inc., California, 2004.
- David S. Wall, *Cyber Crime – The Transformation of Crime in the Information Age*, Polity Press, UK, 2007.

#### DIGITAL TOOLS:

- <https://www.techtarget.com/searchsecurity/definition/cybercrime>
- <https://vikaspedia.in/education/digital-literacy/information-security/cyber-laws>
- <https://www.bbau.ac.in/dept/Law/TM/1.pdf>

#### Mapping of CO with PSO

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	1			1
CO2	1		1	1		
CO3	2	1			1	
CO4	1		2	1		1
CO5	2	1	1	2	2	1

3. Advanced Application    2. Intermediate Development    1. Introductory Level