

SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

M.E- Computer Science and Engineering

(Dept of CSE)

CURRICULUM and SYLLABI

[For students admitted in 2025-2026]

PG Regulations 2023

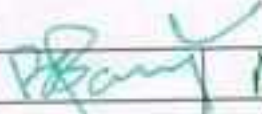

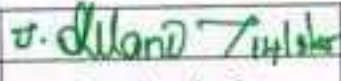

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for M.E/M.Tech. Semester I under Regulations 2023 (CBCS)
Branch: M.E Computer Science and Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	P23MAT101A	Mathematical Foundations of Computer Science	3	1	0	0	4	FC	60	TT
2.	P23CSE101	Advanced Data Structures and Algorithms	3	0	0	0	3	PC	45	T
3.	P23CSE102	Advanced Computer Architecture	3	0	0	0	3	PC	45	T
4.	P23CSE103	Advanced Operating Systems	3	0	0	0	3	PC	45	T
5.	P23GE101	Research Methodology and IPR	3	0	0	0	3	PC	45	T
6.	P23GE702	Audit Course: Stress Management by Yoga	2	0	0	0	0	AC	30	T
Practical courses										
7	P23CSE104	Advanced Data Structures and Algorithms Laboratory	0	0	2	2	2	PC	60	LP
8	P23CSE105	Advanced Operating Systems laboratory	0	0	2	2	2	PC	60	LP
Total Credits							20			

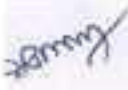
*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L- Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

Approved By

			
Chairperson, CSE BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr. B.Sathiyabhama	Dr. R. Shivakumar	Dr. J. Akilandeswari	Dr. S.R.R. Senthil Kumar

Copy to:-

HOD/ Computer Science and Engineering, First Semester M.E. CSE Students and Staff, COE

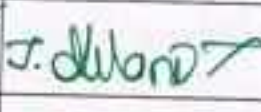



Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for M.E/M.Tech. Semester II under Regulations 2023 (CBCS)
Branch: Computer Science and Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*	
Theory courses											
1.	P23CSE201	Advanced Databases	3	0	0	0	3	PC	45	T	
2.	P23CSE202	Advanced Network Design	3	0	0	0	3	PC	45	T	
3.	P23CSE510	Elective: Web Analytics	3	0	0	0	3	PE	45	T	
4.	P23CSE518	Elective: Software Security	3	0	0	0	3	PE	45	T	
5.	P23CSE525	Elective: Foundation of Data Science	3	0	0	0	3	PE	45	T	
6.	P23GE701	Audit Course: English for Research Paper Writing	2	0	0	0	0	AC	30	T	
Practical courses											
7.	P23CSE203	Advanced Databases Laboratory	0	0	2	2	2	PC	60	LP	
8.	P23CSE204	Advanced Network Design Laboratory	0	0	2	2	2	PC	60	LP	
Total Credits							19				

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

Approved By

 17/12/25			
Chairperson, Computer Science and Engineering BoS Dr.B.Sathiyabhama	Member Secretary, Academic Council Dr.R.Shivakumar	Dean-Academics Dr.J.Akilandeswari	Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

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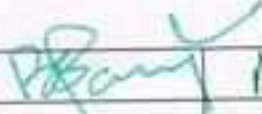

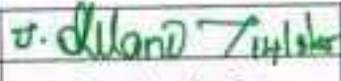

HOD/ Computer Science and Engineering, Second Semester M.E CSE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for M.E/M.Tech. Semester I under Regulations 2023 (CBCS)
Branch: M.E Computer Science and Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*
Theory courses										
1.	P23MAT101A	Mathematical Foundations of Computer Science	3	1	0	0	4	FC	60	TT
2.	P23CSE101	Advanced Data Structures and Algorithms	3	0	0	0	3	PC	45	T
3.	P23CSE102	Advanced Computer Architecture	3	0	0	0	3	PC	45	T
4.	P23CSE103	Advanced Operating Systems	3	0	0	0	3	PC	45	T
5.	P23GE101	Research Methodology and IPR	3	0	0	0	3	PC	45	T
6.	P23GE702	Audit Course: Stress Management by Yoga	2	0	0	0	0	AC	30	T
Practical courses										
7	P23CSE104	Advanced Data Structures and Algorithms Laboratory	0	0	2	2	2	PC	60	LP
8	P23CSE105	Advanced Operating Systems laboratory	0	0	2	2	2	PC	60	LP
Total Credits							20	✓		

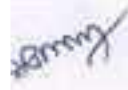
*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L- Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

Approved By


			
Chairperson, CSE BoS	Member Secretary, Academic Council	Dean-Academics	Chairperson, Academic Council & Principal
Dr. B.Sathiyabhama	Dr. R. Shivakumar	Dr. J. Akilandeswari	Dr. S.R.R. Senthil Kumar

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HOD/ Computer Science and Engineering, First Semester M.E. CSE Students and Staff, COE



COMPUTER SCIENCE AND ENGINEERING					
M. E. / COMPUTER SCIENCE AND ENGINEERING					
SEMESTER - I	MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE				
P23MAT101A	L	T	P	J	C
	3	1	0	0	4
Course Outcomes					
At the end of the course, the student will be able to					
CO1:	apply the concept of set theory in machine learning, databases, class-based object-oriented systems and data structures.				
CO2:	apply the concept of logical theory to validate the correctness of software specifications.				
CO3:	analyze the computational processes using combinatorial techniques.				
CO4:	apply the concept of automata, formal languages and turing machines in text processing, compilers, hardware design, programming languages and artificial intelligence.				
CO5:	apply the concept of graph theory in networks of communication, data organization, computational devices and the flow of computation.				
Pre-requisites:					
<ul style="list-style-type: none"> Basics of elementary algebra Basics of calculus 			<ul style="list-style-type: none"> Basics of geometry Basics of discrete mathematics 		
CO/PO, PSO Mapping					
(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak					
COs	Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO5
CO1	3	3	2	3	3
CO2	3	3	2	3	3
CO3	3	3	2	3	3
CO4	3	3	2	3	3
CO5	3	3	2	3	3
Course assessment methods [Theory]					
Direct			Indirect		
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory) Assignment / Problem-solving/ Seminar (10)			Total CIE: 40 marks Semester End Examination: 60 marks		Course end survey
Unit 01	FUNDAMENTAL STRUCTURES				12 Hours
Set theory – relationship between sets – operations on sets – set identities – principle of inclusion and exclusion – relations – binary relations – partial orderings – equivalence relations.					
Unit 02	LOGIC				12 Hours
Propositional logic – logical connectives – truth tables – normal forms (conjunctive and disjunctive) – proof techniques – direct – proof by contradiction – proof by reduction.					

Unit 03	COMBINATORICS			12 Hours
Sum rule – product rule – permutations – combinations – mathematical induction – Pigeon hole principle – principle of inclusion-exclusion – recurrence relations – generating functions.				
Unit 04	MODELING COMPUTATION AND LANGUAGES			12 Hours
Finite state machines – deterministic and non-deterministic finite state machines – formal languages – classes of grammars – context sensitive – context free – regular grammars.				
Unit 05	GRAPHS			12 Hours
Introduction to graphs – graph terminology – representation of graphs – graph isomorphism – connectivity – Euler and Hamilton Paths – shortest path algorithms – spanning trees – minimum spanning tree.				
Theory: 45 Hrs		Tutorial: - 15 Hrs	Practical:	Project:-
Total Hours: 60 Hrs				
TEXT BOOK:				
1.	J. P. Trembley and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science" McGraw Hill Publishers, 1 st Edition, 2017.			
REFERENCE BOOKS:				
1.	K. H. Rosen, "Discrete Mathematics and its Applications", McGraw Hill Publishers, 8 th Edition, 2019.			
2.	R. P. Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Publishers, 5 th Edition, 2006.			
3.	T. Veerarajan, "Discrete Mathematics", McGraw Hill Publishers, 13 th Reprint, 2011.			
M.E/M.TECH REGULATIONS 2023			 HEAD OF THE DEPARTMENT OF MATHEMATICS	
S&H BoS DATE:08-07-2023				

Dr. S. JAYABARATHI
 ASSOCIATE PROFESSOR & HEAD
 DEPARTMENT OF MATHEMATICS,
 SONA COLLEGE OF TECHNOLOGY,
 SALEM-635 005, Tamilnadu.
 Ph: 0427-409999.

P23CSE101	ADVANCED DATA STRUCTURES AND ALGORITHMS	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

- CO1: Design algorithms to solve real-time problems
- CO2: Design and develop algorithms using various hierarchical data structures
- CO3: Develop Graph algorithms to solve real-life problems
- CO4: Apply suitable design strategy for problem solving
- CO5: Analyse various NP hard and NP complete problems

Pre-requisite:

CO/PO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	1	3	1	1	2
CO2	1	1	2	2	1
CO3	1	3	2	3	2
CO4	1	2	2	3	2
CO5	1	2	2	3	2

Course Assessment methods

Direct		Indirect
CIE test I (10) CIE test II (10) CIE test III (10)	Assignment / Problem-solving / Seminar (10) Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey

Unit 01: ROLE OF ALGORITHMS IN COMPUTING

9 Hours

Algorithms – Algorithms as a Technology- Insertion Sort – Analyzing Algorithms – Designing Algorithms- Growth of Functions: Asymptotic Notation – Standard Notations and Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method

Unit 02: HIERARCHICAL DATA STRUCTURES

9 Hours

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red-Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of Btrees – Basic operations on B-Trees – Deleting a key from a B-Tree- Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.

Unit 03: GRAPHS

9 Hours

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; All-Pairs Shortest Paths: Shortest

Paths and Matrix Multiplication – The FloydWarshall Algorithm.				
Unit 04: ALGORITHM DESIGN TECHNIQUES				9 Hours
Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: An Activity-Selection Problem – Elements of the Greedy Strategy- Huffman Codes.				
Unit 05: NP COMPLETE AND NP HARD				9 Hours
NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP- Completeness and Reducibility – NP-Completeness Proofs – NP-Complete Problems				
Theory: 45 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 45 Hrs
REFERENCES				
1.	Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.			
2.	S.Sridhar,Design and Analysis of AlgorithmsI, First Edition, Oxford University Press, 2014.			
3.	Robert Sedgewick and Kevin Wayne, —ALGORITHMS, Fourth Edition, Pearson Education, 2011.			
4.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, —Introduction to AlgorithmsI, Third Edition, Prentice-Hall, 2011.			
5.	Anany Levitin, Introduction to the Design and Analysis of Algorithms, Pearson Education, Third Edtion 2017.			
6.	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Fundamentals of Data Structures in C, Universities Press; Second edition, 2008.			

P23CSE102	ADVANCED COMPUTER ARCHITECTURE		L	T	P	J	C
			3	0	0	0	3
Course Outcomes							
At the end of the course, the student will be able to							
CO1:	Discuss the issues related to multiprocessing and suggest solutions						
CO2:	Discuss the salient features of different multicore architectures and how they exploit parallelism.						
CO3:	Discuss the various techniques used for optimising the cache performance						
CO4:	Design hierarchal memory system						
CO5:	Analyze how data level parallelism is exploited in architectures						
Pre-requisite:							
CO/PO Mapping (3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak							
COs	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5		
CO1	1	3	1	1	2		
CO2	1	1	2	2	1		
CO3	1	3	2	3	2		
CO4	1	2	2	3	2		
CO5	1	2	2	3	2		
Course Assessment methods							
Direct				Indirect			
CIE test I (10) CIE test II (10) CIE test III (10)	Assignment / Problem-solving / Seminar (10) Total CIE: 40 marks Semester End Examination: 60 marks			Course end survey			
Unit 01: FUNDAMENTALS OF COMPUTER DESIGN AND ILP						9 Hours	
Fundamentals of Computer Design – Measuring and Reporting Performance – Instruction Level Parallelism and its Exploitation – Concepts and Challenges –Exposing ILP - Advanced Branch Prediction - Dynamic Scheduling - Hardware-Based Speculation - Exploiting ILP - Instruction Delivery and Speculation - Limitations of ILP – Multithreading							
Unit 02: MEMORY HIERARCHY DESIGN						9 Hours	
Introduction – Optimizations of Cache Performance – Memory Technology and Optimizations – Protection: Virtual Memory and Virtual Machines – Design of Memory Hierarchies – Case Studies.							
Unit 03: MULTIPROCESSOR ISSUES						9 Hours	
Introduction- Centralized, Symmetric and Distributed Shared Memory Architectures –Cache Coherence Issues – Performance Issues – Synchronization – Models of Memory Consistency – Case Study- Interconnection Networks – Buses, Crossbar and Multi-stage Interconnection Networks							

Unit 04: MULTICORE ARCHITECTURES				9 Hours
Homogeneous and Heterogeneous Multi-core Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture. Introduction to Warehouse-scale computers Architectures- Physical Infrastructure and Costs- Cloud Computing –Case Study- Google Warehouse-Scale Computer				
Unit 05: VECTOR, SIMD AND GPU ARCHITECTURES				9 Hours
Introduction-Vector Architecture – SIMD Extensions for Multimedia – Graphics Processing Units – Case Studies – GPGPU Computing – Detecting and Enhancing Loop Level Parallelism-Case Studies				
Theory: 45 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 45 Hrs
REFERENCES				
1.	Darryl Gove, "Multicore Application Programming: For Windows, Linux, and Oracle Solaris", Pearson, 2011			
2.	David B. Kirk, Wen-mei W. Hwu, "Programming Massively Parallel Processors", Morgan Kaufman, 2010			
3.	David E. Culler, Jaswinder Pal Singh, "Parallel computing architecture : A hardware/software approach" , Morgan Kaufmann /Elsevier Publishers, 1999			
4.	John L. Hennessy and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.			
5.	Kai Hwang and Zhi. Wei Xu, "Scalable Parallel Computing", Tata McGraw Hill, NewDelhi, 2003			

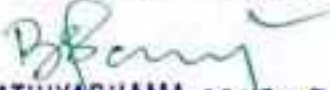
P23CSE103	ADVANCED OPERATING SYSTEMS	L	T	P	J	C
		3	0	0	0	3
Course Outcomes						
At the end of the course, the student will be able to						
CO1:	Apply the operating system concepts to a distributed environment and identify the features specific to distributed systems.					
CO2:	Demonstrate the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating systems.					
CO3:	Discuss the different consistency model, replacement strategy in distributed shared memory.					
CO4:	Apply the distributed system concepts for any scenario.					
CO5:	Analyze the role of operating systems in cloud and mobile environment.					
Pre-requisite:						
CO/PO Mapping (3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak						
COs	Programme Outcomes (POs)					
	PO1	PO2	PO3	PO4	PO5	
CO1	1	3	2	2	1	
CO2	2	2	3	2	1	
CO3	1	1	1	3	2	
CO4	1	1	2	1	2	
CO5	1	2	2	1	1	
Course Assessment methods						
Direct				Indirect		
CIE test I (10)	Assignment / Problem-solving / Seminar (10) Total CIE: 40 marks Semester End Examination: 60 marks			Course end survey		
CIE test II (10)						
CIE test III (10)						
Unit 01: INTRODUCTION					9 Hours	
Distributed Operating Systems – Issues – Communication Primitives – Limitations of a Distributed System – Lamport’s Logical Clocks – Vector Clocks – Causal Ordering of Messages						
Unit 02: DISTRIBUTED OPERATING SYSTEMS					9 Hours	
Distributed Mutual Exclusion Algorithms – Classification – Preliminaries – Simple Solution – Lamport’s Algorithm – Ricart-Agrawala Algorithm – Suzuki-Kasami’s Broadcast Algorithm –Raymond’s Tree-Based Algorithm – Distributed Deadlock Detection – Preliminaries – Centralized Deadlock Detection Algorithms – Distributed Deadlock Detection Algorithms – Path Pushing Algorithm – Edge Chasing Algorithm – Hierarchical Deadlock Detection Algorithms – Agreement Protocols – Classification – Solutions to the Byzantine Agreement Problem – Lamport- Shostak Pease Algorithm						
Unit 03: DISTRIBUTED RESOURCE MANAGEMENT					9 Hours	
Distributed File Systems – Design Issues – Google File System – Hadoop Distributed File System – Distributed Shared Memory – Algorithms for Implementing Distributed Shared Memory – Load Distributing						

4.8.2023

Version 1.0

Programme: M.E (CSE)

PG Regulations- 2023


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 PROFESSOR & HEAD,
 Dept. of Computer Science and Engineering
 SONA COLLEGE OF TECHNOLOGY
 SALEM - 636 005

Algorithms – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol				
Unit 04: REAL TIME OPERATING SYSTEMS				9 Hours
Basic Model of Real - Time Systems – Characteristics – Application of Real - Time Systems – Real - Time Task Scheduling— Handling Resource Sharing –Case Study –Minix OS				
Unit 05: MOBILE AND CLOUD OPERATING SYSTEM				9 Hours
Android – Overall Architecture – Linux Kernel – Hardware Support – Native User-Space – Dalvik and Android's Java –System Services – Introduction to Cloud Operating Systems.				
Theory: 45 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 45 Hrs
REFERENCES				
1.	Mukesh Singhal, Niranjana G.Shivaratri, "Advanced concepts in operating systems: Distributed, Database and multiprocessor operating systems", TMH, 2001			
2.	Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2006.			
3.	Karim Yaghmour, "Embedded Android", O'Reilly, First Edition, 2013.			
4.	Nikolay Elenkov, "Android Security Internals: An In-Depth Guide to Android's Security Architecture", No Starch Press, 2014			


P23CSE104	ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY		L	T	P	J	C
			0	0	2	2	2
Course Outcomes							
At the end of the course, the student will be able to							
CO1:	Design and implement basic and advanced data structures for real applications						
CO2:	Design algorithms using graph structures						
CO3:	Implement for real applications using design techniques						
Pre-requisite:							
CO/PO Mapping (3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak							
COs	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5		
CO1	1	3	2	2	1		
CO2	2	2	3	2	1		
CO3	1	1	1	3	2		
Course Assessment methods							
Direct				Indirect			
CIE test I (10)-Laboratory Quiz 1 (5) CIE test II (10)- Laboratory Quiz 1 (5)	CIE(10)-Project Record(10) Total CIE: 50 marks Semester End Examination (50) SEE :Laboratory			Course end survey			
List of Experiments:							
<ol style="list-style-type: none"> 1. Implementation of Merge Sort and Quick Sort-Algorithms 2. Implementation of a Binary Search Tree 3. Red-Black Tree Implementation 4. Heap Implementation 5. Fibonacci Heap Implementation 6. Graph Traversals 7. Spanning Tree Implementation 8. Shortest Path Algorithms (Dijkstra's algorithm, Bellmann Ford Algorithm) 9. Implementation of Matrix Chain Multiplication 10. Activity Selection and Huffman Coding Implementation. <p>Design and develop application with suitable data structures for the use cases</p> <ul style="list-style-type: none"> • Snakes Game (Arrays) • Sudoku (Backtracking) • Travel Planner (Graphs) • Cash Flow Minimiser (Graphs/Multisets/Heaps) • Text Editor Cut, Copy, Paste (Stack) • File Zipper (Greedy Huffman Encoder) • CB Mario (Dynamic Programming Optimisation in Game) • Jump Froggy (Greedy Optimisation in Game) 							
Theory: 0	Tutorial: 0	Practical: 30	Project: 30	Total Hours: 60 Hrs			

4.8.2023

Version 1.0

Programme: M.E (CSE)

PG Regulations- 2023


Dr. B. SATHIYABHAMA, B.E., M.Tech., Ph.D.
 PROFESSOR & HEAD,
 Dept. of Computer Science and Engineering
 SONA COLLEGE OF TECHNOLOGY
 SALEM - 636 005

P23CSE105	ADVANCED OPERATING SYSTEMS LABORATORY		L	T	P	J	C
			0	0	2	2	2
Course Outcomes							
At the end of the course, the student will be able to							
CO1:	Design and implement basic distributed operating systems concepts						
CO2:	Design algorithms using shared memory						
CO3:	Develop capabilities to work at systems level						
Pre-requisite:							
CO/PO Mapping (3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak							
COs	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5		
CO1	1	3	2	2	1		
CO2	2	2	3	2	1		
CO3	1	1	1	3	2		
Course Assessment methods							
Direct			Indirect				
CIE test I (10)-Laboratory Quiz 1 (5) CIE test II (10)- Laboratory Quiz 1 (5)	CIE(10)-Project Record(10) Total CIE: 50 marks Semester End Examination (50) SEE :Laboratory			Course end survey			
List of Experiments:							
<ol style="list-style-type: none"> 1. Implementation of non token based algorithm for Mutual Exclusion 2. Implementation of Lamport's Logical Clock 3. Implementation of edge chasing distributed deadlock detection algorithm. 4. Implementation of locking algorithm 5. Incrementing a counter in shared memory. 6. Implementation of Remote Method Invocation. 7. Implementation of Remote Procedure Call. 8. Implementation of Chat Server 							
Case Studies							
<ol style="list-style-type: none"> 1. Development of a reasonably sized dynamically loadable kernel module for Linux kernel 2. Study educational operating systems such as Minix (http://www.minix3.org/), Weenix (http://weenix.cs.brown.edu/mediawiki/index.php/Weenix) and develop reasonably sized interesting modules for them 3. Study the Android open source operating system for mobile devices (http://source.android.com/) and develop / modify some modules. 4. Study any embedded and real-time operating system such as eCos (http://ecos.sourceforge.org/) and develop / modify some modules. 							
Theory: 0	Tutorial: 0	Practical: 30	Project: 30	Total Hours: 60 Hrs			

COURSE OUTCOMES:

At the end of the course, the student will be able to

1. Review the literature of the research problem
2. Choose appropriate data collection and sampling method according to the research problem.
3. Interpret the results of research and communicate effectively with their peers
4. Explain the Importance of intellectual property rights
5. Evaluate trade mark, develop and register patents.

CO/PO, PSO Mapping (3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak COs Programme Outcomes (POs) and Programme Specific Outcomes (PSOs)					
COs	PO1	PO2	PO3	PO4	PO5
CO1	2	3	3	3	3
CO2	2	3	3	3	3
CO3	2	3	3	3	3
CO4	2	3	3	3	3
CO5	3	3	3	3	3

Course Assessment methods

Direct	Indirect
CIE test I (10) (Theory) CIE test II (10) (Theory) CIE test III (10) (Theory)	Assignment / Problem –Solving /Seminar (10) Total CIE: 40 Marks Semester End Examination : 60 Marks
	Course end survey

UNIT I INTRODUCTION TO RESEARCH METHODS

9

Definition and Objective of Research, Various steps in Scientific Research, Types of Research, Criteria for Good Research, Defining Research Problem, Research Design , Case Study Collection of Primary and Secondary Data, Collection Methods: Observation, Interview, Questionnaires, Schedules,

UNIT II SAMPLING DESIGN AND HYPOTHESIS TESTING

9

steps in Sampling Design, Types of Sample Designs, Measurements and Scaling Techniques -Testing of hypotheses concerning means (one mean and difference between two means -one tailed and two tailed tests), concerning variance — one tailed Chi-square test.

UNIT II INTERPRETATION AND REPORT WRITING

9

Techniques of Interpretation, Precaution in Interpretation, Layout of Research Report, Types of Reports, Oral Presentation, Mechanics of Writing Research Report

UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY

9

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights, Innovations and Inventions trade related intellectual property rights.

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4.8.23

UNIT V TRADE MARKS, COPY RIGHTS AND PATENTS

9

Purpose and function of trade marks, acquisition of trade mark rights, trade mark registration processes, trademark claims —trademark Litigations- International trademark law Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Lecture: 45, Tutorial: 0, Total: 45 Hours

TEXT BOOKS

1. C.R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques An Edition, New Age International Publishers, 2019.
2. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets", Delmar Cengage Learning, 4th Edition, 2012.
3. Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", Tata Mc Graw Hill Education, 1st Edition, 2008.


REFERENCE BOOKS

1. Panneerselvam, R., Research Methodology, Second Edition, Prentice-Hall of India, New Delhi, 2013.
2. Ranjith Kumar, Research Methodology — A step by step Guide for Begineers, 4th edition, Sage publisher, 2014.
3. D Llewelyn & T Aplin W Cornish, "Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights", Sweet and Maxwell, 1st Edition, 2016.
4. Ananth Padmanabhan, "Intellectual Property Rights-Infringement and Remedies", Lexis Nexis, 1st Edition, 2012.
5. Ramakrishna B and Anil Kumar H.S, "Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers", Notion Press, 1st Edition, 2017.
6. M.Ashok Kumar and Mohd. Iqbal Ali : "Intellectual Property Rights" Serials Pub

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P23GE702	Stress Management by Yoga	L	T	P	J	C
		2	0	0	0	0
Course Outcomes						
At the end of the course, the student will be able to						
CO1:	Develop physical and mental health thus improving social health					
CO2:	Increase immunity power of the body and prevent diseases					
CO3:	Accelerate memory power					
CO4:	Achieve the set goal with confidence and determination					
CO5:	Improve stability of mind, pleasing personality and work with awakened wisdom					
Course Assessment methods						
Direct				Indirect		
CIE test I (30)	Total CIE: 100 marks		Course end survey			
CIE test II (30)	Semester End Examination: NIL					
CIE test III (40)						
Unit 01:					6 Hours	
Yoga-Introduction - Astanga Yoga- 8 parts-Yam and Niyam etc.- Do's and Don'ts in life-Benefits of Yoga and Asana- Yoga Exercise- and benefits- Pranayam Yoga- Nadi suthi, Practice and Spinal Sclearance Practice-Regularization of breathing techniques and its effects-Practice and kapalapathy practice.						
Unit 02:					6 Hours	
Neuromuscular breathing exercise and Practice- Magarasa Yoga, 14 points Acupressure techniques and practice-Body relaxation practice and its benefits- Raja Yoga- 1.Agna –explanation and practice- Activation of Pituitary- Raja Yoga- 2. Santhi Yoga-Practice-Balancing of physical and mental power.						
Unit 03:					6 Hours	
Raja Yoga- 3. Sagarathara yoga –practice- Activation of dormant brain cells-Kayakalpa-theory- Kayakalpa –practice-Yogic exercise to improve physical and mental health and practice-Asanas –explanation-Practice-benefits						
Unit 04:					6 Hours	
Sun namaskar- 12 poses-explanation and practice-Yoga –Asana-Padmasana, vajrasana,chakrasana, viruchasana etc-Stress management with Yoga-Role of women and Yoga Equality, nonviolence, Humanity, Self- control- Food and yoga Aware of self-destructive habits Avoid fault thinking (thought analysis-Practice)-Yoga Free from ANGER (Neutralization of anger)& practice						
Unit 05:					6 Hours	
Moralisation of Desire & practice- Punctuality-Love-Kindness-Compassion Eradication of worries-Practice - Personality development, positive thinking-Good characters to lead a moral life How to clear the polluted mind- Benefits of blessing- Five- fold culture –explanation- Karma Yoga Practice In Geetha- Sense of duty-Devotion, self- reliance, confidence, concentration, truthfulness, cleanliness.						
Theory: 30 Hrs		Tutorial: –	Practical: –	Project:--	Total Hours: 30 Hrs	
REFERENCES						
1	"Yogic Asanas for Group Tarining-Part-I" Janardan Swami Yogabhyasi Mandal, Nagpur					
2	"Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama (Publication Department), Kolkata					

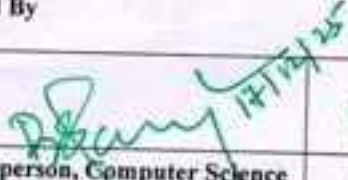

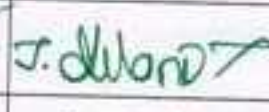
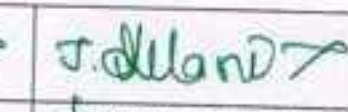

 HOD
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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for M.E/M.Tech. Semester II under Regulations 2023 (CBCS)
Branch: Computer Science and Engineering

S.No	Course Code	Course Title	L	T	P	J	C	Category	Total Contact Hours	Course Type*	
Theory courses											
1.	P23CSE201	Advanced Databases	3	0	0	0	3	PC	45	T	
2.	P23CSE202	Advanced Network Design	3	0	0	0	3	PC	45	T	
3.	P23CSE510	Elective: Web Analytics	3	0	0	0	3	PE	45	T	
4.	P23CSE518	Elective: Software Security	3	0	0	0	3	PE	45	T	
5.	P23CSE525	Elective: Foundation of Data Science	3	0	0	0	3	PE	45	T	
6.	P23GE701	Audit Course: English for Research Paper Writing	2	0	0	0	0	AC	30	T	
Practical courses											
7.	P23CSE203	Advanced Databases Laboratory	0	0	2	2	2	PC	60	LP	
8.	P23CSE204	Advanced Network Design Laboratory	0	0	2	2	2	PC	60	LP	
Total Credits							19				

*T- Theory, TT- Theory with Tutorial, TL- Theory with Laboratory, TP- Theory with Project, TLP- Theory with Laboratory and Project, L-Laboratory, LT- Laboratory with Theory, LP- Laboratory with Project

Approved By

			
Chairperson, Computer Science and Engineering BoS Dr.B.Sathiyabhama	Member Secretary, Academic Council Dr.R.Shivakumar	Dean-Academics Dr.J.Akilandeswari	Chairperson, Academic Council & Principal Dr.S.R.R.Senthil Kumar

Copy to:-

HOD/ Computer Science and Engineering, Second Semester M.E CSE Students and Staff, COE

P23CSE201	ADVANCED DATABASES	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Comprehend the various database revolution
CO2:	Work with NoSQL databases to analyze the big data for useful business Applications.
CO3:	Analyze the different data models based on data representation methods and storage needs
CO4:	Design and develop using application programming interface with SQL and NoSQL databases
CO5:	Discover the survey on future generation databases

CO/PO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

Cos	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	2
CO2	2	1	3	2	2
CO3	3	1	3	3	2
CO4	3	1	3	2	2
CO5	3	1	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10)	Assignment / Problem-solving / Seminar (10) Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey
CIE test II (10)		
CIE test III (10)		

Unit 01: INTRODUCTION

Database Revolutions- System Architecture- Relational Database- Database Design Data Storage- Transaction Management- Data warehouse and Data Mining- Information Retrieval

9 Hours

Unit 02: Document Databases

Big Data Revolution- CAP Theorem- Birth of NoSQL- Document Database—XML Databases- JSON Document Databases- Graph Databases. Column Databases— Data Warehousing Schemes- Columnar Alternative- Sybase IQ- C-store and Vertica- Column Database Architectures- SSD and In-Memory Databases— In Memory Databases- Berkeley Analytics Data Stack and Spark

9 Hours

Unit 03: Distributed Database Patterns

Distributed Relational Databases- Non-relational Distributed Databases- MongoDB - Sharing and Replication- HBase- Cassandra Consistency Models— Types of Consistency- Consistency MongoDB- HBase Consistency- Cassandra Consistency.

9 Hours

Unit 04: Data Models and Storage

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Semester II

PG Regulations- 2023 (ME/M.Tech)

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SQL- NoSQL APIs- Return SQL- Advance Databases-PostgreSQL- Riak-HBase-MongoDB-Cassandra Query Language-MapReduce-Pig-DAG-Cascading-Spark- CouchDB- NEO4J- Redis

Unit 05: Future Database

9 Hours

Database of Future-Key value database-Distributive transaction-Other Convergent Databases- Disruptive Database Technologies-Storage Technologies-BlockChain-Quantum Computing.

Theory: 45 Hrs

Tutorial: 0


Practical: 0

Project: 0

Total Hours: 45 Hrs

REFERENCES

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", Sixth Edition, Mc Graw Hill Education, 2013
2. Guy Harrison, "Next Generation Databases", A press, 2015
3. Eric Redmond, Jim R Wilson, "Seven Databases in Seven Weeks", LLC. 2012
4. Dan Sullivan, "NoSQL for Mere Mortals", Addison-Wesley, 2015
5. Adam Fowler, "NoSQL for Dummies", John Wiley & Sons, 2015


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P23CSE202	ADVANCED NETWORK DESIGN				L	T	P	J	C
					3	0	0	0	3
Course Outcomes									
At the end of the course, the student will be able to									
CO1:	Describe the fundamental concepts of computer networks.								
CO2:	Analyze the QoS properties in BE and GS models								
CO3:	Describe the basic working principles of LTE networks								
CO4:	Analyze the performance of SDN								
CO5:	Analyze the performance of NGN								
CO/PO Mapping									
(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak									
Cos	Programme Outcomes (POs)								
	PO1	PO2	PO3	PO4	PO5				
CO1	2	-	2	3	2				
CO2	3	-	3	2	2				
CO3	3	1	2	3	3				
CO4	2	1	3	2	3				
CO5	3	1	3	3	3				
Course Assessment methods									
Direct					Indirect				
CIE test I (10)	Assignment / Problem-solving / Seminar (10)				Course end survey				
CIE test II (10)	Total CIE: 40 marks								
CIE test III (10)	Semester End Examination: 60 marks								
Unit 01: INTRODUCTION TO COMPUTER NETWORKING								9 Hours	
Communication Networks –Network Elements –Switched Networks and Shared media Networks – Probabilistic Model and Deterministic Model –Datagrams and Virtual Circuits –Multiplexing–Switching - Error and Flow Control –Congestion Control –Layered Architecture –Network Externalities –Service Integration.									
Unit 02: QUALITY OF SERVICE								9 Hours	
Traffic Characteristics and Descriptors –Quality of Service and Metrics –Best Effort model and guaranteed Service Model –Limitations of IP networks –Scheduling and Dropping Policies for BE and GS models – Traffic Shaping Algorithms–End to End Solutions –Laissez Faire Approach –Possible improvements in TCP –Significance of UDP in Inelastic Traffic									
Unit 03: SOFTWARE DEFINED NETWORKING								9 Hours	
Evolution of SDN -Control Plane - Control and data plane separation - Network Virtualization - Data Plane - Programming SDNs - Verification and Debugging - Openflow networks.									

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Unit 04: INTERNET OF THINGS					9 Hours
Introduction - Definition and Characteristics of IoT - Physical design - IoT Protocols - Logical design - IoT communication models-IoT Communication APIs - Enabling technologies - Wireless Sensor Networks- Cloud Computing-Big data analytics, Communication protocols-Embedded Systems. IoT Levels and Templates - Domain specific IoTs - IoT Architectural view.IoT systems management – Needs – NETCONF-YANG - IoT design methodology-Case studies					
Unit 05: NEXT GENERATION NETWORKS					9 Hours
Next Generation Wireless Networks: GSM Evolution - WiMAX Networks - Long Term Evolution (LTE) - 5G architecture: Basics about RAN architecture, High-level requirements for the 5G architecture - Integration of LTE and new air interface to fulfill 5G Requirements - Physical architecture and 5G deployment.					
Theory: 45 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 45 Hrs	
REFERENCES					
1.	James Macfarlane," Network Routing Basics: Understanding IP Routing in Cisco Systems", Wiley edition 1 2006				
2.	Jean Warland and Pravin Vareya, High Performance Networks, Morgan Kauffman Publishers, 2002				
3.	Larry L Peterson and Bruce S Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufman Publishers, 2012				
4.	Jingming Li Salina, Pascal Salina "Next Generation Networks-perspectives and potentials" Wiley, January 2008.				
5.	Madhusanga Liyanage, Andrei Gurtov, Mika Ylianttila, "Software Defined Mobile Networks beyond LTE Network Architecture", Wiley, June 2015				
6.	Thomas Nadeau, Ken Gray, "SDN - Software Defined Networks", O'reilly Publishers, 2013.				
7.	Savo G Glisic," Advanced Wireless Networks- Technology and Business models", Wiley, 3rd edition- 2016.				
8.	Thomas Plavky, —Next generation Telecommunication Networks, Services and Management, Wiley & IEEE Press Publications, 2010.				
9.	Afif Osseiran, Jose F. Monserrat, Patrick Marsch, "5G Mobile and Wireless Communications Technology", 1 st edition, Cambridge University Press, 2016				
10	Arshdeep Bahga, Vijay Madisetti, "Internet of Things-A hands-on approach", Universities Press, 2015.				
11	Surya Durbha and Jyoti Joglekar, "Internet of Things", Oxford University Press, 2021				


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P23CSE510	WEB ANALYTICS				L	T	P	J	C
					3	0	0	0	3
Course Outcomes									
At the end of the course, the student will be able to									
CO1:	Comprehend the theoretical foundations and research scope of web analytics.								
CO2:	Analyze and model web data using rigorous data collection and preprocessing methodologies.								
CO3:	Apply statistical and experimental techniques to study user behavior on the web.								
CO4:	Evaluate and optimize web systems using advanced analytics, machine learning, and visualization methods.								
CO5:	Analyze the privacy, ethical, and emerging research challenges in web analytics.								
CO/PO Mapping (3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak									
COs	Programme Outcomes (POs)								
	PO1	PO2	PO3	PO4	PO5				
CO1	3	2	1	2	1				
CO2	2	3	2	2	2				
CO3	2	3	3	2	2				
CO4	2	2	3	3	3				
CO5	3	2	2	2	3				
Course Assessment methods									
Direct					Indirect				
CIE test I (10)	Assignment / Problem-solving / Seminar (10)				Course end survey				
CIE test II (10)	Total CIE: 40 marks								
CIE test III (10)	Semester End Examination: 60 marks								
UNIT 01 FOUNDATIONS OF WEB ANALYTICS								9 Hours	
Evolution of Web Analytics – Role of Web Analytics in Computer Science Research – Web Analytics vs Digital Analytics – Types of Web Analytics (Descriptive, Diagnostic, Predictive, Prescriptive) – Research Questions and Hypothesis Formulation using Web Data – Web Analytics Life Cycle – Metrics, Dimensions, and KPIs from a Research Perspective – Challenges and Open Research Problems in Web Analytics.									
UNIT 02 WEB DATA COLLECTION, MODELLING AND DATA QUALITY								9 Hours	
Web Data Sources and Architectures – Client-side and Server-side Data Collection – Log Files, Page Tagging, and Event-based Tracking – Clickstream Data Modelling – Sessionization and User Identification – Data Cleaning, Transformation, and Feature Engineering – Sampling Bias, Noise, and Missing Data – Data Validation, Reliability, and Reproducibility in Web Analytics Research.									
UNIT 03 USER BEHAVIOR ANALYTICS AND EXPERIMENTAL METHODS								9 Hours	
User Behavior Modelling – Traffic Source and Channel Analysis – User Segmentation and Clustering –									

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Navigation and Path Analysis – Funnel, Cohort, and Retention Analysis – Conversion Modelling – A/B Testing and Multivariate Experiments – Statistical Significance, Confidence Intervals, and Causal Inference – Case Studies from Research Literature.				
Unit 04: ADVANCED ANALYTICS, OPTIMIZATION AND VISUALIZATION				9 Hours
Predictive Analytics for Web Data – Attribution Models and Customer Journey Analysis – Machine Learning Techniques for Web Analytics – Recommendation and Personalization Systems – Web Performance and UX Analytics – Conversion Rate Optimization (CRO) Models – Data Visualization Principles – Analytical Dashboards – Visual Analytics and Storytelling for Research Insights.				
Unit 05: PRIVACY, ETHICS AND EMERGING RESEARCH TRENDS				9 Hours
Privacy-preserving Web Analytics – Data Protection Regulations and Compliance (GDPR, Consent Models) – Ethical Issues and Responsible Analytics – Security Challenges in Web Data – Cross-device and Cross-platform Analytics – Mobile, App, and Social Media Analytics – Real-time and Streaming Web Analytics – Emerging Trends, Research Directions, and Future Challenges in Web Analytics.				
Theory: 45 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 45 Hrs
REFERENCES				
1.	Alejandro F. Crespo, "Measuring and Optimizing Digital Experiences", Apress, 2021.			
2.	Eric T. Peterson, "Web Analytics Demystified: A Marketer's Guide to Understanding How Your Web Site Affects Your Business", Celilo Group Media, 2004.			
3.	Jason Burby and Shane Atchison, "Actionable Web Analytics", Wiley Publishing, 2007			
4.	Justin Cutroni, "Google Analytics", O'Reilly Media, 2013.			
5.	Avinash Kaushik, "Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity", Sybex, 2010.			

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P23CSE525	FOUNDATIONS OF DATA SCIENCE	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Define the data science process.
CO2:	Understand different types of data description for data science process
CO3:	Gain knowledge on relationships between data
CO4:	Use the python libraries for data wrangling
CO5:	Apply visualization libraries in python to interpret and explore data

CO/PO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

Cos	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	2
CO2	3	1	3	2	2
CO3	3	1	3	3	2
CO4	3	1	3	2	2
CO5	3	1	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) CIE test II (10) CIE test III (10)	Assignment / Problem-solving / Seminar (10) Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey

Unit 01: INTRODUCTION 9 Hours

Data Science: Benefits and uses – facets of data – Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation – Exploratory Data analysis – build the model– presenting findings and building applications – Data Mining – Data Warehousing – Basic Statistical descriptions of Data

Unit 02: DESCRIBING DATA 9 Hours

Types of Data – Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages – Describing Variability – Normal Distributions and Standard (z) Scores

Unit 03: DESCRIBING RELATIONSHIPS 9 Hours

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line, – Standard error of estimate – interpretation of r^2 –multiple regression equations –regression towards the mean

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Unit 04: PYTHON LIBRARIES FOR DATA WRANGLING				9 Hours
Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables				
Unit 05: DATA VISUALIZATION				9 Hours
Foundation for a Science of Data Visualization – Environment- Optics –Optimal Display – Overview about Lightness, Brightness, Contrast, Constancy, Color –Visual attention that Pops Out - Importing Matplotlib – Line plots – Scatter plots – three-dimensional plotting – Geographic Data with Basemap – Visualization with Seaborn.				
Theory: 45 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 45 Hrs
REFERENCES				
1.	David Cielien, Arno D. B, Meysman and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016.			
2.	Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.			
3.	Jake Vander Plas, "Python Data Science Handbook", O'Reilly, 2016.			
4.	Matthew O. Ward, George Grinstein, Daniel Keim, "Interactive Data Visualization: Foundation, Techniques and Applications", Second Edition, A. K. Peters/CRC Press, 2015			

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P23CSE518	SOFTWARE SECURITY	L	T	P	J	C
		3	0	0	0	3

Course Outcomes

At the end of the course, the student will be able to

CO1:	Comprehend the theoretical foundations and research challenges of software security.
CO2:	Analyze software systems to identify vulnerabilities using formal and empirical methods.
CO3:	Apply secure design and implementation techniques grounded in security research.
CO4:	Evaluate advanced software security testing, analysis, and verification approaches.
CO5:	Analyze the emerging threats, defenses, and future research directions in software security.

CO/PO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

Cos	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	3	2	1	2	1
CO2	2	3	2	2	2
CO3	2	3	3	2	2
CO4	2	2	3	3	3
CO5	3	2	2	2	3

Course Assessment methods

Direct		Indirect
CIE test I (10)	Assignment / Problem-solving / Seminar (10) Total CIE: 40 marks Semester End Examination: 60 marks	Course end survey
CIE test II (10)		
CIE test III (10)		

Unit 01: FOUNDATIONS OF SOFTWARE SECURITY 9 Hours

Introduction to Software Security – Security vs Reliability and Safety – Threat Models and Adversary Capabilities – Software Attack Surface – Vulnerability Taxonomies (CWE, CVE) – Secure Software Life Cycle (SSDLC) – Security Requirements Engineering – Research Methodologies in Software Security – Open Research Problems and Case Studies.

Unit 02: SECURE SOFTWARE DESIGN AND ARCHITECTURE 9 Hours

Principles of Secure Design – Least Privilege, Defense in Depth, Fail-safe Defaults – Secure Architecture Patterns – Threat Modeling Techniques (STRIDE, Attack Trees) – Design-level Vulnerabilities – Secure API and Framework Design – Microservices and Cloud-native Security Architectures – Architectural Risk Analysis – Research Trends in Secure System Design.

Unit 03: SECURE PROGRAMMING AND VULNERABILITY ANALYSIS 9 Hours

Secure Coding Practices – Language-based Security Issues (C/C++, Java, Python) – Memory Safety, Type Safety, and Information Flow – Common Software Vulnerabilities (Buffer Overflows, Injection, XSS,

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CSRF)– Static Code Analysis – Dynamic Analysis and Fuzzing – Symbolic Execution – Empirical Studies on Vulnerability Discovery.				
Unit 04: SOFTWARE SECURITY TESTING, VERIFICATION AND ASSURANCE				9 Hours
Security Testing Fundamentals – Penetration Testing vs Secure Testing – Static Application Security Testing (SAST) – Dynamic Application Security Testing (DAST) – Interactive and Runtime Analysis – Formal Methods for Software Security – Model Checking and Program Verification – Security Metrics and Benchmarking – Research Case Studies.				
Unit 05: MALWARE AND EMERGING RESEARCH TRENDS				9 Hours
Malware Analysis Fundamentals – Software Exploitation Techniques – Reverse Engineering – Secure Software Supply Chain – DevSecOps and Continuous Security – Software Security in AI and ML Systems – Privacy-preserving Software – Ethics and Responsible Disclosure – Emerging Threats and Defense Mechanisms – Future Research Directions in Software Security.				
Theory: 45 Hrs	Tutorial: 0	Practical: 0	Project: 0	Total Hours: 45 Hrs
REFERENCES				
1.	Ross Anderson, "Security Engineering: A Guide to Building Dependable Distributed Systems", 3rd Edition, Wiley, 2020.			
2.	Gary McGraw, "Software Security: Building Security In", Addison-Wesley Professional, 2021.			
3.	Mark Dowd, John McDonald, Justin Schuh, "The Art of Software Security Assessment: Identifying and Preventing Software Vulnerabilities", 2nd Edition, Addison-Wesley Professional, 2019.			
4.	Sven Schrecker, Ravi Raghavan, Paul M. Jones, Tom Messinides, "Architecting Secure Software Systems", IBM Redbooks / Addison-Wesley, 2020			
5.	Edward Amoroso, "Cyber Attacks: Protecting National Infrastructure", 2nd Edition, Butterworth-Heinemann, 2021.			
6.	Michael Howard, David LeBlanc, "Writing Secure Code", 2nd Edition, Microsoft Press, 2020.			


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 SALEM - 636 005

P23CSE203	ADVANCED DATABASES LABORATORY	L	T	P	J	C
		0	0	2	2	2

Course Outcomes

At the end of the course, the student will be able to

CO1: Create and work on distributed, object oriented and parallel databases

CO2: Experiment on active and deductive database

CO3: Design the database using XML for real time application

CO/PO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

Cos	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	2
CO2	3	2	3	2	2
CO3	3	1	3	3	2
CO4	3	3	3	2	2
CO5	3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) -Laboratory Quiz 1 (5) CIE test II (10) -Laboratory Quiz 2 (5)	CIE test III (10) -Project Record (10) Total CIE: 50 marks Semester End Examination: 50 marks SEE :Laboratory	Course end survey

List of Experiments:

1. Distributed Database design for real time application
2. Deadlock Detection Algorithm for distributed database using wait- for graph
3. Experiment using Object Oriented Database – Extended Entity Relationship (EER)
4. Design Parallel Database for real time application
5. Parallel Database – Implementation of Parallel Join and Parallel Sort
6. Active Database – Implementation of Triggers & Assertions for Bank Database
7. Model building and interpretation of results using WEKA tool
8. Implementation of an Efficient Query Optimization
9. Designing XML Schema for a given database
10. Integrate Node.js with SQL Database (MySQL/PostgreSQL/Oracle)
11. Integrate Node.js with No SQL Database (MongoDB/Cassandra)

Theory: 0	Tutorial: 0	Practical: 30	Project: 30	Total Hours: 60 Hrs
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12.12.2025

Version 1.1

Semester II

PG Regulations- 2023 (ME/M.Tech)

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SONA COLLEGE OF TECHNOLOGY

S.A.I.E.M - 636 005

P23CSE204	ADVANCED NETWORK DESIGN LABORATORY	L	T	P	J	C
		0	0	2	2	2

Course Outcomes

At the end of the course, the student will be able to

CO1: Design and develop TCP/UDP client – server applications using java

CO2: Develop client – server applications using Python

CO3: Simulate network applications using ns2

CO/PO Mapping

(3/2/1 indicates the strength of correlation) 3-Strong, 2-Medium, 1-Weak

Cos	Programme Outcomes (POs)				
	PO1	PO2	PO3	PO4	PO5
CO1	2	2	2	3	2
CO2	2	2	3	2	2
CO3	3	3	3	3	2
CO4	3	3	3	2	2
CO5	3	3	3	3	3

Course Assessment methods

Direct		Indirect
CIE test I (10) -Laboratory Quiz 1 (5) CIE test II (10) -Laboratory Quiz 2 (5)	CIE test III (10) -Project Record (10) Total CIE: 50 marks Semester End Examination: 50 marks SEE :Laboratory	Course end survey

List of Experiments:

1. Design a TCP client/server application
2. Design a UDP client/server application
3. Design an Iterative UDP server with 2 or 3 clients
4. Build client applications for major APIs (Amazon S3, Twitter etc) in Python
5. Design an application that interacts with e-mail servers in python
6. Design applications that work with remote servers using SSH, FTP etc in Python
7. Create a LAN Network and compare the performance between MAC protocols using ns-2
8. Simulate DVR and LSR routing using ns-2
9. Create a wireless network environment with mobile nodes and transfer the data using AODV using ns-2
10. Projects using CISCO packet tracer

Theory: 0 Hrs	Tutorial: 0	Practical: 30	Project:30	Total Hours: 60 Hrs
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SATYAM-616 005

P23GE701	English for Research Paper Writing		L	T	P	J	C
			2	0	0	0	0
Course Outcomes							
At the end of the course, the student will be able to							
CO1:	Demonstrate research writing skills both for research articles and thesis						
CO2:	Frame suitable title and captions as sub-headings for articles and thesis						
CO3:	Write each section in a research paper and thesis coherently						
CO4:	Use language appropriately and proficiently for effective written communication						
CO5:	Exhibit professional proof-reading skills to make the writing error free						
Course Assessment methods							
Direct				Indirect			
CIE test I (30)		Total CIE: 100 marks		Course end survey			
CIE test II (30)		Semester End Examination: NIL					
CIE test III (40)							
Unit 01:						6 Hours	
Planning and preparation, word order, breaking up long sentences, organising ideas into paragraphs and sentences, being concise and avoiding redundancy, ambiguity and vagueness							
Unit 02:						6 Hours	
Interpreting research findings, understanding and avoiding plagiarism, paraphrasing sections of a paper/ abstract.							
Unit 03:						6 Hours	
Key skills to frame a title, to draft an abstract, to give an introduction							
Unit 04:						6 Hours	
Skills required to organise review of literature, methods, results, discussion and conclusions							
Unit 05:						6 Hours	
Usage of appropriate phrases and key terms to make the writing effective - proof-reading to ensure error-free writing							
Theory: 30 Hrs		Tutorial: --		Practical: --		Project:--	
Total Hours: 30 Hrs							
TEXT BOOKS							
1.	Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011						
2.	Highman N , Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book, 1998						
3.	Day R, How to Write and Publish a Scientific Paper, Cambridge University Press, 2006.						
4.	Goldbort R, Writing for Science, Yale University Press, 2006. (available on Google Books)						
REFERENCES							
1	Martin Cutts, Oxford Guide to Plain English, Oxford University Press, Second Edition, 2006						


HOD

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