SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

M.E-Computer Science and Engineering

(Computer Science and Engineering)

CURRICULUM and SYLLABI

[For students admitted in 2021-2022]

M.E / M.Tech Regulation 2019

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME I Semester under Regulations 2019
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	P19CSE101	Mathematical Foundations of Computer Science	2	1	0	3	45
2	P19CSE102	Advanced Data Structures and Algorithms	3	0	0	3	45
3	P19CSE103	Advanced Network Principles and Protocols	3	0	0	3	45
4	P19CSE104	Artificial Intelligence	3	0	0	3	45
5	P19GE101	Research Methodology and IPR	2	0	0	2	30
6	P19GE702	**Audit Course:** Stress Management by YOGA	2	0	0	0	30
Practical							
7	P19CSE105	Advanced Data Structures and Algorithms Laboratory	0	0	4	2	60
8	P19CSE106	Network Programming Laboratory	0	0	4	2	60
					Total Credits	**18**	

Approved by

Chairperson, Computer Science and Engineering BOS
Dr.B.Sathiyabhama

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/CSE, First Semester ME CSE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	P19CSE201	Advanced Databases	3	0	0	3	45
2	P19CSE202	Machine Learning	3	0	0	3	45
3	P19CSE509	**ELECTIVE**- Agile software Development	3	0	0	3	45
4	P19CSE510	**ELECTIVE**-Data Warehousing and Data Mining	3	0	0	3	45
5	P19CSE506	**ELECTIVE**-Software Testing	3	0	0	3	45
6	P19GE701	**Audit Course**-English for Research Paper Writing	2	0	0	0	30
Practical							
7	P19CSE203	Advanced Database Laboratory	0	0	4	2	60
8	P19CSE204	Machine Learning Laboratory	0	0	4	2	60
					Total Credits	**19**	

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Copy to:-
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Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME III Semester under Regulations 2019
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	P19CSE504	**Professional Elective-** Graph Theory	3	0	0	3	45
2	P19CSE512	**Professional Elective-** Information Retrieval Techniques	3	0	0	3	45
3	P19ISE601	**Open Elective-** Transport Safety	3	0	0	3	45
	P19WMC601	**Open Elective-** Mobile Technology and Network					
Practical							
4	P19CSE301	Project Work Phase-1	0	0	16	8	240
					Total Credits	**17**	

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Copy to:-
HOD/CSE, Third Semester ME CSE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME IV Semester under Regulations 2019
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Practical							
1	P19CSE401	Project Work Phase – II	0	0	28	14	420
					Total Credits	**14**	

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Copy to:-
HOD/CSE, Fourth Semester ME CSE Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME I Semester under Regulations 2019
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	P19CSE101	Mathematical Foundations of Computer Science	2	1	0	3	45
2	P19CSE102	Advanced Data Structures and Algorithms	3	0	0	3	45
3	P19CSE103	Advanced Network Principles and Protocols	3	0	0	3	45
4	P19CSE104	Artificial Intelligence	3	0	0	3	45
5	P19GE101	Research Methodology and IPR	2	0	0	2	30
6	P19GE702	**Audit Course:** Stress Management by YOGA	2	0	0	0	30
Practical							
7	P19CSE105	Advanced Data Structures and Algorithms Laboratory	0	0	4	2	60
8	P19CSE106	Network Programming Laboratory	0	0	4	2	60
					Total Credits	**18**	

Approved by

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Dr.B.Sathiyabhama

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Copy to:-
HOD/CSE, First Semester ME CSE Students and Staff, COE

P19CSE101 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

L T P C M
2 1 0 3 100

COURSE OUTCOMES

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

1. Apply the concept of set theory in machine learning, databases, class-based object-oriented systems and data structures.
2. Apply the concept of logical theory to validate the correctness of software specifications.
3. Apply the computational process using combinatorial techniques
4. Apply the concept of automata, formal languages and turing machines in text processing, compilers, hardware design, programming languages and artificial intelligence
5. Apply the concept of graph theory in networks of communication, data organization, computational devices and the flow of computation.

UNIT I FUNDAMENTAL STRUCTURES 9

Set theory- Relationships between sets – Operations on sets – Set identities - Principle of inclusion and exclusion – Relations – Binary relations – Partial orderings – Equivalence relations.

UNIT II LOGIC **9**

Propositional logic – Logical connectives – Truth tables – Normal forms (conjunctive and disjunctive) – Proof techniques – Direct – Proof by contradiction – Proof by reduction

UNIT III COMBINATORICS **9**

Sum-rule, Product-rule, Permutations, Combinations, Mathematical Induction, Pigeon-hole Principle, Principle of inclusion- exclusion, Recurrence Relations, Generating Functions

UNIT IV MODELING COMPUTATIONAND LANGUAGES 9

Finite state machines – Deterministic and Non- deterministic finite state machines – Formal Languages – Classes of Grammars –Context Sensitive – Context Free – Regular Grammars.

UNIT V GRAPHS 9

Introduction to Graphs – Graph terminology – Representation of Graphs – Graph Isomorphism – Connectivity – Euler and Hamilton Paths – Shortest path algorithms – Spanning trees – Minimum spanning tree.

Theory :30 hours Tutorial :15 hours Total: 45

REFERENCE BOOKS

1. J. P. Trembley and R. Manohar, "Discrete Mathematical Structures with Applications to Computer Science" McGraw Hill Publishers, 1st Edition 2017.
2. K. H. Rosen, "Discrete Mathematics and its Applications", McGraw Hill Publishers, 5th Edition, 2003.
3. R. P. Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Publishers, 5th Edition, 2006.
4. T. Veerarajan, "Discrete Mathematics", McGraw Hill Publishers, 13th Reprint 2011.

P19CSE102 ADVANCED DATA STRUCTURES AND ALGORITHMS **LT P C M**

3 0 0 3 100

COURSE OUTCOMES

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

1. Design algorithms to solve real-time problems
2. Design and develop algorithms using various hierarchical data structures
3. Develop Graph algorithms to solve real-life problems
4. Apply suitable design strategy for problem solving
5. Analyse various NP hard and NP complete problems

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	P0 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO1	3	3	3	3	**2**	**2**	**2**	**2**	**1**	**2**	**2**	3	3	3	3
CO2	3	3	3	3	**2**	**2**	**2**	**2**	**2**	**2**	**2**	3	3	3	3
CO3	3	3	3	3	**2**	**2**	**2**	**2**	**2**	**2**	**1**	3	3	3	3
CO4	3	3	3	3	**2**	**2**	**2**	**2**	**2**	**2**	**2**	3	3	3	3
CO5	3	3	3	3	**2**	**2**	**2**	**2**	**2**	**2**	**2**	3	3	3	3

UNIT I ROLE OF ALGORITHMS IN COMPUTING 9

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 II HIERARCHICAL DATA STRUCTURES 9

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 III GRAPHS 9

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 IV ALGORITHM DESIGN TECHNIQUES 9

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 V NP COMPLETE AND NP HARD 9

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP- Completeness and Reducability – NP-Completeness Proofs – NP-Complete Problems

Total: 45 H

REFERENCE BOOKS

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 Algorithms‖, 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 Algorithms‖, 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.

P19CSE103 ADVANCED NETWORK PRINCIPLES AND PROTOCOLS

L	T	P	C	Marks
3	0	0	3	100

COURSE OUTCOMES

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

1. Describe the fundamental concepts of computer networks
2. Analyze the QoS properties in BE and GS models
3. Describe the basic working principles of LTE networks
4. Analyze the performance of SDN
5. Analyze the performance of NGN

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	1	1	2	2	2	3	2	3	3
CO2	3	3	3	3	3	2	1	1	1	2	1	3	1	3	3
CO3	3	3	3	2	3	3	2	1	1	1	2	3	2	3	3
CO4	3	3	3	3	3	2	2	1	1	2	2	3	1	3	3
CO5	3	3	3	3	3	3	3	1	1	2	2	3	2	3	3

UNIT I FOUNDATIONS OF NETWORKING 9

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 II QUALITY OF SERVICE 9

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 III NEXT GENERATION NETWORKS 9

Introduction to next generation networks - Changes, Opportunities and Challenges, Technologies, Networks, and Services, Next Generation Society, future Trends. Introduction to LTE-A –Requirements and Challenges, network architectures –EPC, E-UTRAN architecture-mobility management, resource management, services, channel -logical and transport channel mapping, downlink/uplink data transfer, MAC control element, PDU packet formats, scheduling services, random access procedure.

UNIT IV SOFTWARE DEFINED NETWORKING 9

Evolution of SDN -Control Plane - Control and data plane separation - Network Virtualization - Data Plane - Programming SDNs - Verification and Debugging - openflow networks.

UNIT V NGN ARCHITECTURE 9

Evolution towards NGN-Technology requirements, NGN functional architecture- Transport stratum, service stratum, service/ content layer and customer terminal equipment function. NGN entities, Network and Service evolution -fixed, mobile, cable and internet evolution towards NGN

Total: 45 H

REFERENCE BOOKS

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 Plavyk, ―Next generation Telecommunication Networks, Services and Management‖, Wiley & IEEE Press Publications, 2010.

P19CSE104 **ARTIFICIAL INTELLIGENCE** **L T P C Marks**

3 0 0 3 100

COURSE OUTCOMES

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

1. Design an intelligent agent by considering the nature of environment and applications
2. Solve the problems related to search application
3. Design knowledge base for any application using propositional/first order logic
4. Implement a suitable multi agent system for the given problem
5. Design a communicative agent for NLP application

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	1	2	2	2	2	2	2	2	2	3	3
CO2	3	3	3	2	2	2	1	1	2	2	1	3	2	3	3
CO3	3	3	3	2	2	1	2	2	2	1	2	2	2	3	3
CO4	3	3	3	2	2	2	2	2	2	3	3	3	2	3	3
CO5	3	3	3	2	2	1	2	3	2	1	3	1	2	3	3

UNIT I INTRODUCTION **9**

Introduction to Artificial Intelligence-The Foundations of Artificial Intelligence. The History of Artificial Intelligence-Intelligent Agents: Agents and Environments-The Concept of Rationality-The Nature of Environments-The Structure of Agents- Problem-Solving Agents-Example problems

UNIT II PROBLEM SOLVING USING SERACH TECHNIQUES **9**

Uninformed Search Strategies- Avoiding Repeated States- Searching with Partial Information- Informed Search and Exploration: Informed (Heuristic) Search Strategies- Heuristic Functions- Local Search Algorithms and Optimization Problems- Constraint Satisfaction problems-Adversarial search- minimax algorithm- Alpha-Beta pruning

UNIT III KNOWLEDGE AND REASONING 9

Knowledge-Based agents – Logic –Propositional logic – First order logic- Representation – Syntax and semantics – Knowledge engineering – Inference in First order logic- Unification and lifting- Forward and backward chaining-Resolution

UNIT IV SOFTWARE AGENTS 9

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT V COMMUNICATION AND APPLICATIONS OF AI 9

Communication: Phrase Structure Grammars - A Formal Grammar for a Fragment of English- Syntactic Analysis (Parsing) – Augmented Grammar and Semantic Interpretation - Machine translation –Speech recognition Tool for Artificial Intelligence -Tensor flow and IBM Watson

Total: 45 H

REFERENCE BOOKS

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Third Edition, Prentice Hall, 2015
2. Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013.
3. Nils J. Nilsson, "Artificial Intelligence: A New Synthesis", Harcourt Asia Pvt. Ltd., 2009.
4. George F. Luger, "Artificial Intelligence-Structures and Strategies for Complex Problem Solving", Pearson Education, 2009.
5. Tom Mitchell, "Machine Learning", McGraw Hill, 2015.
6. P. Flach, "Machine Learning: The art and science of algorithms that make sense of data", Cambridge University Press, 2012.
7. M. Mohri, A. Rostamizadeh, and A. Talwalkar, "Foundations of Machine Learning", MIT Press, 2012.

P19GE101 RESEARCH METHODOLOGY AND IPR L T P C Marks
2 0 0 2 100

COURSE OUTCOMES

At the end of the course, the students 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 strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	2	1	1	3	2	3	2	3	3
CO2	3	3	3	3	3	3	1	2	1	3	1	3	1	3	3
CO3	3	3	3	3	3	3	2	2	1	3	2	3	1	3	3
CO4	3	3	3	3	3	2	2	2	1	2	1	3	1	3	3
CO5	3	3	3	3	3	3	2	2	1	2	2	3	2	3	3

UNIT I INTRODUCTION TO RESEARCH METHODS 6

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 6

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 III INTERPRETATION AND REPORT WRITING 6

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 6

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

UNIT V TRADE MARKS, COPY RIGHTS AND PATENTS 6

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

Total: 30 H

REFERENCE BOOKS

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

P19GE702 STRESS MANAGEMENT BY YOGA

L	T	P	C	Marks
2	0	0	0	100

COURSE OUTCOMES

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

1. Develop physical and mental health thus improving social health
2. Increase immunity power of the body and prevent diseases
3. Accelerate memory power
4. Achieve the set goal with confidence and determination
5. Improve stability of mind, pleasing personality and work with awakened wisdom

CO / PO, PSO Mapping
(3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	2	0	2	2	3	2	2	0	3	2	1	3
CO2	2	3	1	2	0	2	2	2	2	1	0	3	1	1	3
CO3	2	0	1	2	0	2	3	2	1	1	0	3	1	3	3
CO4	2	2	1	2	0	2	2	3	2	2	0	3	1	2	3
CO5	2	2	1	2	0	3	3	1	2	1	0	3	2	2	3

UNIT I **6**

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- Nadisuthi, Practice and Spinal Sclearance Practice-Regularization of breathing techniques and its effects-Practice and kapalapathy practice.

UNIT II **6**

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 III **6**

Raja Yoga-3.Sagasrathara 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 IV **6**

Sun namaskar- 12 poses-explanation and practice-Yoga –Asana-Padmasana, vajrasana,chakrasana, viruchasanaetc-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 V **6**

Moralisation of Desire & practice- Punctuality-Love-Kindness-CompassionEradication ofworries-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.

Total: 30 H

REFERENCE BOOKS

1. 'Yogic Asanas for Group Tarining-Part-I" Janardan Swami YogabhyasiMandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, AdvaitaAshrama

P19CSE105 ADVANCED DATA STRUCTURES AND ALGORITHMS LABORATORY

L T P C M
0 0 4 2 100

COURSE OUTCOMES

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

1. Design and implement basic and advanced data structures for real applications+
2. Design algorithms using graph structures
3. Implement for real applications using design techniques

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	2	3	3	2	2	3	3	3
CO2	3	3	3	3	2	2	2	2	3	3	2	2	3	3	3
CO3	3	3	3	3	2	2	2	2	3	3	3	2	3	3	3

List of Experiments:

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.

Total: 60 H

P19CSE106 NETWORK PROGRAMMING LABORATORY

L	T	P	C	Marks
0	0	4	2	100

COURSE OUTCOMES

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

1. Design and develop client – server applications using java
2. Develop client – server applications using Python
3. Simulate network applications using ns2

CO / PO, PSO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2-Medium, 1-Weak															
COs	**Programme Outcomes (POs) and Programme Specific Outcome (PSOs)**														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**P09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	3	3	3	2	2	2	2	3	2	2	3	3	3
CO2	3	3	3	3	2	2	2	2	2	3	2	2	3	3	3
CO3	3	3	3	3	2	2	2	2	2	3	3	2	3	3	3

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. Create a TCP based network and trace the performance of Slow Start congestion control algorithm using ns-2
11. You are to write a Python network server program that will accept an unlimited number of connections, one at a time. Upon receiving a connection, it should send back to the client the client's IP address. Then it should wait for commands from the client. Valid commands are "TIME", "IP" and "EXIT". To the TIME command, the server should return the current time (see Example of obtaining a time string). To the IP command, it should again return the client's IP address. If the client closes the connection or does not respond with a command in a reasonable time (10 seconds), the server should close the current connection and wait for another connection (see Setting a timeout on a socket). To the EXIT command, your server should close all open sockets and exit. Below are two client programs for purposes of testing your server. Feel free to modify the client programs as needed while testing your server

Total: 60 H

P19GE702 **Stress Management by Yoga**

2000

Course Outcomes:

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

1. Develop physical and mental health thus improving social health
2. Increase immunity power of the body and prevent diseases
3. Accelerate memory power
4. Achieve the set goal with confidence and determination
5. Improve stability of mind, pleasing personality and work with awakened wisdom

UNIT – I **6**

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 – II **6**

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 – III **6**

Raja Yoga- 3. Sagasrathara 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 –IV **6**

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 – V **6**

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.

Reference Books

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

Total: 30 hours

Dr. M. Renuga
BoS – Chairperson,
Science & Humanities
HOD / H&L

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2019
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	P19CSE201	Advanced Databases	3	0	0	3	45
2	P19CSE202	Machine Learning	3	0	0	3	45
3	P19CSE509	**ELECTIVE**- Agile software Development	3	0	0	3	45
4	P19CSE510	**ELECTIVE**-Data Warehousing and Data Mining	3	0	0	3	45
5	P19CSE506	**ELECTIVE**-Software Testing	3	0	0	3	45
6	P19GE701	**Audit Course**-English for Research Paper Writing	2	0	0	0	30
Practical							
7	P19CSE203	Advanced Database Laboratory	0	0	4	2	60
8	P19CSE204	Machine Learning Laboratory	0	0	4	2	60
					Total Credits	**19**	

Approved by

Chairperson, Computer Science and Engineering BOS
Dr.B.Sathiyabhama

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/CSE, Second Semester ME CSE Students and Staff, COE

P19CSE201	ADVANCED DATABASES	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

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

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

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1	1	2	2	1	3	2	2	3
CO2	3	3	3	2	1	1	1	1	1	1	1	3	1	3	3
CO3	3	3	3	3	1	1	2	1	2	3	1	3	1	3	3
CO4	3	3	3	2	2	1	2	1	1	2	1	3	1	3	3
CO5	3	3	3	3	3	2	2	1	3	1	1	3	2	3	3

UNIT I Introduction **9**

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

UNIT II Document Databases **9**

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.

UNIT III Distributed Database Patterns **9**

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

UNIT IV Data Models and Storag **9**

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

UNIT V Future Database **9**

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

Total: 45

REFERENCE BOOKS

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

P19CSE202	MACHINE LEARNING	L	T	P	C	Marks
		3	0	0	3	100

COURSE OUTCOMES

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

- Comprehend machine learning basics
- Implement supervised learning algorithms for the given application and analyze the results
- Use tools to implement typical clustering algorithms for different types of applications
- Design and implement an HMM for a sequence model type of application
- Comprehend the advanced learning algorithms and identify the suitable applications for solving using these advanced learning techniques

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1	1	2	2	1	3	2	2	3
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CO3	3	3	3	3	1	1	2	1	2	3	1	3	1	3	3
CO4	3	3	3	2	2	1	2	1	1	2	1	3	1	3	3
CO5	3	3	3	3	3	2	2	1	3	1	1	3	2	3	3

UNIT I INTRODUCTION **9**

Machine Learning -Machine Learning Foundations –Overview –Design of a Learning system - Types of machine learning –Applications Mathematical foundations of machine learning -random variables and probabilities -Probability Theory –Probability distributions -Decision Theory-Bayes Decision Theory - Information Theory

UNIT II SUPERVISED LEARNING **9**

Linear Models for Regression -Linear Models for Classification –Naïve Bayes -Discriminant Functions - Probabilistic Generative Models -Probabilistic Discriminative Models -Bayesian Logistic Regression. Decision Trees -Classification Trees-egression Trees -Pruning. Neural Networks -Feed-forward Network Functions - Back-propagation. Support vector machines -Ensemble methods-Bagging-Boosting.

UNIT III UNSUPERVISED LEARNING **9**

Clustering-K-means -EM Algorithm-Mixtures of Gaussians. The Curse of Dimensionality -Dimensionality Reduction -Factor analysis -Principal Component Analysis -Probabilistic PCA-Independent components analysis**.**

UNIT IV PROBABILISTIC GRAPHICAL MODELS 9

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

UNIT V ADVANCED LEARNING 9

Sampling –Basic sampling methods –Monte Carlo. Reinforcement Learning-K-Armed Bandit-Elements - Model-Based Learning-Value Iteration-Policy Iteration. Temporal Difference Learning-Exploration Strategies-Deterministic and Non-deterministic Rewards and Actions Computational Learning Theory -Mistake bound analysis, sample complexity analysis, VC dimension. Occam learning, accuracy and confidence boosting

Total: 45

REFERENCE BOOKS

1. Christopher Bishop, “Pattern Recognition and Machine Learning” Springer, 2007.
2. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
3. EthemAlpaydin, “Introduction to Machine Learning”, MIT Press, Third Edition, 2014.
4. Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman,”Mining of Massive Datasets”, Cambridge University Press, Second Edition.
5. 2016Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
6. Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", Springer, Second Edition, 2011.
7. Stephen Marsland, “Machine Learning -An Algorithmic Perspective”, Chapman and Hall/CRC Press, Second Edition, 2014

P19CSE204	MACHINE LEARNING LABORATORY	L	T	P	C	Marks
		0	0	4	2	100

COURSE OUTCOMES

At the end of experiments, the students will be able to

- Understand the implementation procedures for the machine learning algorithms
- Solve the problems using machine learning techniques in image and language processing applications
- Choose appropriate algorithms/ techniques to solve computing problems in real-world.

List of Experiments:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file
2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample
4. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets
5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set
7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs
11. Case Study on google Colab

P19CSE203	ADVANCED DATABASES LABORATORY	L	T	P	C	Marks
		0	0	4	2	100

COURSE OUTCOMES

At the end of experiments, the students will be able to

- Create and work on distributed, object oriented and parallel databases
- Experiment on active and deductive database
- Design the database using XML for real time application

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)

P19GE701 English for Research Paper Writing 2 0 0 0

Course Outcomes:

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

- Demonstrate research writing skills both for research articles and thesis
- Frame suitable title and captions as sub-headings for articles and thesis
- Write each section in a research paper and thesis coherently
- Use language appropriately and proficiently for effective written communication
- Exhibit professional proof-reading skills to make the writing error free

Unit – I **6**

Planning and preparation, word order, breaking up long sentences, organising ideas into paragraphs and sentences, being concise and avoiding redundancy, ambiguity and vagueness

Unit – II **6**

Interpreting research findings, understanding and avoiding plagiarism, paraphrasing sections of a paper/ abstract.

Unit- III **6**

Key skills to frame a title, to draft an abstract, to give an introduction

Unit – IV **6**

Skills required to organise review of literature, methods, results, discussion and conclusions

Unit – V **6**

Usage of appropriate phrases and key terms to make the writing effective - proof-reading to ensure error-free writing.

Text Books:

1.Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2.HighmanN , 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)

Total: 30 hours

REFERENCES

1. Martin Cutts, Oxford Guide to Plain English, Oxford University Press, Second Edition, 2006

P19CSE509 AGILE SOFTWARE DEVELOPMENT **L T P C** **Marks**
3 0 0 3 **100**

COURSE OUTCOMES

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

- Understand the background and driving forces for taking an Agile approach to software development
- Articulate the agile principles, practices, and roles of Scrum
- Perform testing activities within an Agile project
- Apply design principles and refactoring to achieve Agility
- Understand the business value of adopting Agile approaches

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	1	1	1	2	2	1	3	2	2	3
CO2	3	3	3	2	1	1	1	1	1	1	1	3	1	3	3
CO3	3	3	3	3	1	1	2	1	2	3	1	3	1	3	3
CO4	3	3	3	2	2	1	2	1	1	2	1	3	1	3	3
CO5	3	3	3	3	3	2	2	1	3	1	1	3	2	3	3

UNIT I FUNDAMENTALS OF AGILE

The Genesis of Agile - Introduction and background - Agile Manifesto and Principles-Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development - Agile project management - Design and development practices in Agile Projects - Test Driven Development - Continuous Integration – Refactoring – Pair Programming - Simple Design - User Stories - Agile Testing - Agile Tools

UNIT II AGILE SCRUM FRAMEWORK

Introduction to Scrum - Project phases - Agile Estimation - Planning game – Product Backlog - Sprint backlog - Iteration planning - User story definition - Characteristics and content of user stories - Acceptance tests and Verifying stories - Project velocity –Burn down chart - Sprint planning and retrospective - Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team - Scrum case study - Tools for Agile project management

UNIT III AGILE TESTING

The Agile lifecycle and its impact on testing - Test-Driven Development (TDD) – xUnit framework and tools for TDD - Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle - Exploratory testing - Risk based testing – Regression Tests - Test Automation - Tools to support the Agile tester

UNIT IV AGILE SOFTWARE DESIGN AND DEVELOPMENT

Agile design practices - Role of design Principles including Single Responsibility Principle - Open Closed Principle - Liskov Substitution Principle – Interface Segregation Principles - Dependency Inversion Principle in Agile Design - Need and significance of Refactoring - Refactoring Techniques - Continuous Integration - Automated build tools - Version control

UNIT V INDUSTRY TRENDS

Market scenario and adoption of Agile - Agile ALM - Roles in an Agile project – Agile Applicability - Agile in Distributed teams - Business benefits - Challenges in Agile - Risks and Mitigation - Agile projects on Cloud - Balancing Agility with Discipline - Agile rapid development technologies

REFERENCE BOOKS

1. Agile Software Development with Scrum, Ken Schawber, Mike Beedle, Publisher Pearson.
2. Agile Testing: A Practical Guide for Testers and Agile Teams, Lisa Crispin, Janet Gregory, Publisher: Addison Wesley
3. Agile Software Development, Principles, Patterns and Practices, Robert C. Martin Publisher: Prentice Hall
4. Agile Software Development: The Cooperative Game, By Alistair Cockburn Publisher Addison Wesley
5. David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering Applying the Theory of Constraints for Business Results, Prentice Hall, 2003
6. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.

P19CSE506 SOFTWARE TESTING L T P C Marks
3 0 0 3 100

COURSE OUTCOMES

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

- Interpret a model for testing and understand the process of testing
- Apply software testing techniques in real-time projects
- Assess the adequacy of test suites using program control flow and data flow
- Use industry-standard testing tools such as JUnit, Code Cover, and IBM Rational FunctionalTester.
- Analyze the strengths and weaknesses of well-established testing techniques and select the appropriate ones for particular real-time projects

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO3	3	3	3	3	1	1	2	1	2	3	1	3	1	3	3
CO4	3	3	3	2	2	1	2	1	1	2	1	3	1	3	3
CO5	3	3	3	3	3	2	2	1	3	1	1	3	2	3	3

UNIT I FUNDAMENTALS 8

Purpose of Testing – A Model for Testing – A Taxonomy of Bugs – Path Testing– Predicates – Path Predicates and Achieving Paths – Path Sensitizing Path Instrumentation – Implement and Application of Path Testing.

UNIT II TRANSACTION–FLOW TESTING 10

Transaction Flows – Transaction – Flow Testing Techniques – Data Flow Testing Basics – Data Flow Testing Strategies – Domain and Paths – Domain Testing – Domain and Interface Testing – Domains and Testability

UNIT III METRICS 9

Metrics – What and Why – Linguistic Metrics – Structural Metrics – HybridMetrics – Metrics Implementation

UNIT IV SYNTAX TESTING **9**

Why – What – and How – A Grammar for formats – Test Case Generation-Implementation and Application – Logic Based Testing – Overview – Decision Tables – Path Expression – KV Charts – Specifications

UNIT V IMPLEMENTATION **9**

Overview – Strategies for Programmers – Strategies for Independent Testers Tests for Software Products –Tools.

Total: 45

REFERENCE BOOKS

1. Boris Beizer, "Software Testing Techniques", 2nd Edition, Dream tech press, 2003
2. Ed Edward Kit, "Software Testing in the Real World - Improving the Process", PearsonEducation, 2004
3. William E. Perry, "Effective methods for software testing", 2nd Edition, John Wiley, 2000

P19CSE510 DATA WAREHOUSING AND DATA MINING L T P C Marks

3 0 0 3 100

COURSE OUTCOMES

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

- Describe the role of statistics in data mining and identify a suitable mining technique to solve the given problem
- Identify and apply various data preprocessing techniques to improve data quality
- Analyze various classifications and clustering methods
- Apply OLAP operations to query processing in data mining
- Apply various mining techniques to developing areas-Web mining, Text mining and social networks and time series data

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
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CO3	3	3	3	3	1	1	2	1	2	3	1	3	1	3	3
CO4	3	3	3	2	2	1	2	1	1	2	1	3	1	3	3
CO5	3	3	3	3	3	2	2	1	3	1	1	3	2	3	3

UNIT I

INTRODUCTION 9

Relation to Statistics, Databases- Data Mining Functionalities-Steps in Data Mining Process-Architecture of a Typical Data Mining Systems- Classification of Data Mining Systems - Overview of Data Mining Techniques-Issues

UNIT II

DATA PREPROCESSING AND ASSOCIATION RULES 9

Data Preprocessing-Data Cleaning, Integration, Transformation, Reduction, and Discretization Concept Hierarchies- Concept Description: Data Generalization And Summarization Based Characterization- Mining Association Rules In Large Databases – Analysis of Attribute Relevance- Exploratory Data Analysis Using tools(Python, Weka and R).

UNIT III

PREDICTIVE MODELING **9**

Classification and Prediction: Issues Regarding Classification and Prediction-Classification By Decision Tree Induction-Bayesian Classification-Classification by Back Propagation - Other Classification Methods-Prediction- Clusters Analysis: Types Of Data In Cluster Analysis- Categorization Of Major Clustering Methods: Partitioning Methods –Hierarchical Methods – Density Based Methods – Grid Based – Model Based – Outlier Analysis- Case Studies using tools(Python, Weka and R)

UNIT IV

DATA WAREHOUSING **9**

Data Warehousing Components -Multi Dimensional Data Model- Data Warehouse Architecture-Data Warehouse Implementation- -Mapping the Data Warehouse to Multiprocessor Architecture- OLAP Need-Categorization of OLAP Tools – OLAP Operations in Multidimensional Data Model

UNIT V

APPLICATIONS **9**

Recent trends in Distributed Warehousing and Data Mining, Class Imbalance Problem; Graph Mining; Social Network Analysis-Web Mining- Sentimental Analysis-Mining Multimedia data on the Web, Automatic classification of Web documents- Mining Time Series data and Sequential Pattern Mining

Total: 45

REFERENCE BOOKS

1. Jiawei Han, Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, 2002.
2. Alex Berson,Stephen J. Smith, “Data Warehousing, Data Mining,& OLAP”, Tata Mcgraw- Hill, 2004.
3. Usama M.Fayyad, Gregory Piatetsky - Shapiro, Padhrai Smyth And Ramasamy Uthurusamy, "Advances In Knowledge Discovery And Data Mining", The M.I.T Press, 1996.
4. Ralph Kimball, "The Data Warehouse Life Cycle Toolkit", John Wiley & Sons Inc., 1998.
5. Sean Kelly, "Data Warehousing In Action", John Wiley & Sons Inc., 1997.
6. Vipin Kumar, Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach, Addison Wesley, 2006.
7. Jure Leskovec, Anand Rajaraman and Jeffrey D. Ullman,”Mining of Massive Datasets”, Cambridge University Press, Second Edition,2016
   G Dong and J Pei, Sequence Data Mining, Springer, 2007

P19GE701 **English for Research Paper Writing**

2 0 0 0

Course Outcomes:

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

- Demonstrate research writing skills both for research articles and thesis
- Frame suitable title and captions as sub-headings for articles and thesis
- Write each section in a research paper and thesis coherently
- Use language appropriately and proficiently for effective written communication
- Exhibit professional proof-reading skills to make the writing error free

Unit – I **6**

Planning and preparation, word order, breaking up long sentences, organising ideas into paragraphs and sentences, being concise and avoiding redundancy, ambiguity and vagueness

Unit – II **6**

Interpreting research findings, understanding and avoiding plagiarism, paraphrasing sections of a paper/ abstract.

Unit- III **6**

Key skills to frame a title, to draft an abstract, to give an introduction

Unit – IV **6**

Skills required to organise review of literature, methods, results, discussion and conclusions

Unit – V **6**

Usage of appropriate phrases and key terms to make the writing effective - proof-reading to ensure error-free writing.

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

Martin Cutts, Oxford Guide to Plain English, Oxford University Press, Second Edition, 2006

Total: 30 hours

Dr. M. Renuga
BoS – Chairperson,
Science & Humanities
HOD / H&L

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME III Semester under Regulations 2019
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Theory							
1	P19CSE504	**Professional Elective-** Graph Theory	3	0	0	3	45
2	P19CSE512	**Professional Elective-** Information Retrieval Techniques	3	0	0	3	45
3	P19ISE601	**Open Elective-** Transport Safety	3	0	0	3	45
	P19WMC601	**Open Elective-** Mobile Technology and Network					
Practical							
4	P19CSE301	Project Work Phase-1	0	0	16	8	240
					Total Credits	**17**	

Approved by

Chairperson, Computer Science and Engineering BOS
Dr.B.Sathiyabhama

Member Secretary, Academic Council
Dr.R.Shivakumar

Chairperson, Academic Council & Principal
Dr.S.R.R.Senthil Kumar

Copy to:-
HOD/CSE, Third Semester ME CSE Students and Staff, COE

P19CSE504 **GRAPH THEORY** **L T P C Marks**

3 0 0 3 100

COURSE OUTCOMES

At the end of each unit, the students will be able to -

- Describe the basic concepts of graphs, and different types of graphs
- Explain the properties of trees and prove the theorems
- Analyze the various representation in graph planar models
- Apply matching and colouring the various the network security tools and applications
- Apply suitable graph algorithm to solve real application.

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	1	1	2	2	1	3	2	2	3
CO2	3	2	3	2	3	3	2	2	1	2	1	3	3	3	3
CO3	3	3	3	3	2	1	1	2	2	2	1	3	3	3	3
CO4	3	3	3	2	3	2	2	1	2	3	2	3	3	3	3
CO5	3	3	2	3	3	2	3	2	3	3	3	3	3	3	3

UNIT I INTRODUCTION **9**

Introduction – Graph Terminologies – Types of Graphs – Sub Graph- Multi Graph – Regular Graph – Isomorphism – Isomorphic Graphs – Sub-graph – Euler graph – Hamiltonian Graph -Related Theorems

UNIT II TREES **9**

Properties- Distance and Centres – Types – Rooted Tree– Tree Enumeration Labeled Tree – Unlabelled Tree – Spanning Tree – Fundamental Circuits- Cut Sets -Properties – Fundamental Circuit and Cut-set- Connectivity- Separability -Related Theorems

UNIT III PLANARITY **9**

Network Flows – Planar Graph – Representation – Detection – Dual Graph – Geometric and Combinatorial Dual – Related Theorems – Digraph – Properties – Euler Digraph

UNIT IV MATCHING AND COLORING **9**

Matrix Representation – Adjacency matrix- Incidence matrix- Circuit matrix – Cut-set matrix -Path Matrix- Properties – Related Theorems – Correlations. Graph Coloring – Chromatic Polynomial – Chromatic Partitioning – Matching – Covering – Related Theorems

UNIT V CONNECTIVITY 9

Graph Algorithms- Connectedness and Components- Spanning Tree- Fundamental Circuits- Cut Vertices- Directed Circuits- Shortest Path – Applications overview.

Total: 45

REFERENCE BOOKS

1. Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Prentice-Hall of India Pvt.Ltd, 2003.
2. L.R.Foulds , "Graph Theory Applications", Springer ,2016
3. Bondy, J. A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication,2008
4. West, D. B., ―Introduction to Graph Theory‖, Pearson Education, 2011.
5. Diestel, R, "Graph Theory", Springer,3rd Edition,2006.
6. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Mc Graw Hill ,2007

P19CSE512 INFORMATION RETRIEVAL TECHNIQUES

L	T	P	C	Marks
3	0	0	3	100

COURSE OUTCOMES

At the end of each unit, the students will be able to –

- Describe the concepts of Information Retrieval system.
- Analyze various models of retrieval methods..
- Identify and design the various components of an Information Retrieval system.
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval
- Design an efficient search engine and analyze the Web content structure.

CO / PO, PSO Mapping

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

COs	Programme Outcomes (POs) and Programme Specific Outcome (PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	P09	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	1	1	2	2	1	3	2	2	3
CO2	3	2	3	2	3	3	2	2	1	2	1	3	3	3	3
CO3	3	3	3	3	2	1	1	2	2	2	1	3	3	3	3
CO4	3	3	3	2	3	2	2	1	2	3	2	3	3	3	3
CO5	3	3	2	3	3	2	3	2	3	3	3	3	3	3	3

UNIT I INTRODUCTION 9

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics– The impact of the web on IR —IR Versus Web Search–Components of a Search engine

UNIT II MODELING **9**

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing

UNIT III INDEXING 9

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching - Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT IV CLASSIFICATION AND CLUSTERING 9

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering –Matrix decompositions and latent semantic indexing – Fusion and Meta learning

UNIT V SEARCHING THE WEB 9

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

Total: 45

REFERENCES

1. Christopher D. Manning, Prabhakar Raghavan, Hinrich Schutze, ―Introduction to Information Retrieval‖, Cambridge University Press, First South Asian Edition, 2008.
2. Implementing and Evaluating Search Engines‖, The MIT Press, Cambridge, Massachusetts London, England, 2010
3. Ricardo Baeza – Yates, Berthier Ribeiro – Neto, ―Modern Information Retrieval: The concepts and Technology behind Search‖ (ACM Press Books), Second Edition, 2011.
4. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, ―Information Retrieval

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Courses of Study for ME IV Semester under Regulations 2019
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit	Total Contact Hours
Practical							
1	P19CSE401	Project Work Phase – II	0	0	28	14	420
					Total Credits	**14**	

Approved by

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HOD/CSE, Fourth Semester ME CSE Students and Staff, COE