

**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 2020-2021]**

**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
<b>Theory</b>						
1	P19CSE101	Mathematical Foundations of Computer Science	2	1	0	3
2	P19CSE102	Advanced Data Structures and Algorithms	3	0	0	3
3	P19CSE103	Advanced Network Principles and Protocols	3	0	0	3
4	P19CSE104	Artificial Intelligence	3	0	0	3
5	P19GE101	Research Methodology and IPR	2	0	0	2
6	P19GE702	<b>Audit Course</b> :Stress Management by YOGA	2	0	0	0
<b>Practical</b>						
7	P19CSE105	Advanced Data Structures and Algorithms Laboratory	0	0	4	2
8	P19CSE106	Network Programming Laboratory	0	0	4	2
<b>Total Credits</b>						<b>18</b>

**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
<b>Theory</b>							
1	P19CSE201	Advanced Databases	3	0	0	3	45
2	P19CSE202	Machine Learning	3	0	0	3	45
3	P19CSE509	<b>Elective</b> -Agile Software Development	3	0	0	3	45
4	P19CSE508	<b>Elective</b> -Internet of Things	3	0	0	3	45
5	P19CSE506	<b>Elective</b> -Software Testing	3	0	0	3	45
6	P19GE701	<b>Audit Course</b> -English for Research Paper Writing	2	0	0	0	30
<b>Practical</b>							
7	P19CSE203	Advanced Database Laboratory	0	0	4	2	60
8	P19CSE204	Machine Learning Laboratory	0	0	4	2	60
<b>Total Credits</b>						<b>19</b>	

**Approved by**

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Copy to:-

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

**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
<b>Theory</b>							
1	P19CSE505	<b>Elective-</b> Network Security	3	0	0	0	45
2	P19CSE507	<b>Elective-</b> Natural Language Processing	3	0	0	0	45
3	P19CEM601	<b>Open Elective-</b> Disaster Mitigation and Management	3	0	0	3	45
<b>Practical</b>							
4	P19CSE301	Project Work Phase - I	0	0	16	8	240
<b>Total Credits</b>						<b>17</b>	

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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
<b>Practical</b>							
1	P19CSE401	Project Work Phase – II	0	0	28	14	420
<b>Total Credits</b>						<b>14</b>	

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**Dr.B.Sathiyabhama**

**Member Secretary, Academic Council**  
**Dr.R.Shivakumar**

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Copy to:-

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

**Sona College of Technology, Salem**  
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**Computer Science and Engineering**  
**Branch: M.E. Computer Science and Engineering**

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<b>Theory</b>						
1	P19CSE101	Mathematical Foundations of Computer Science	2	1	0	3
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4	P19CSE104	Artificial Intelligence	3	0	0	3
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7	P19CSE105	Advanced Data Structures and Algorithms Laboratory	0	0	4	2
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Copy to:-

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

<b>P19CSE101</b>	<b>MATHEMATICAL FOUNDATIONS OF</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Marks</b>
	<b>COMPUTER SCIENCE</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>100</b>

**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.

<b>UNIT I</b>	<b>FUNDAMENTAL STRUCTURES</b>	<b>9</b>
	Set theory- Relationships between sets – Operations on sets – Set identities - Principle of inclusion and exclusion – Relations – Binary relations – Partial orderings – Equivalence relations.	
<b>UNIT II</b>	<b>LOGIC</b>	<b>9</b>
	Propositional logic – Logical connectives – Truth tables – Normal forms (conjunctive and disjunctive) – Proof techniques – Direct – Proof by contradiction – Proof by reduction	
<b>UNIT III</b>	<b>COMBINATORICS</b>	<b>9</b>
	Sum-rule, Product-rule, Permutations, Combinations, Mathematical Induction, Pigeon-hole Principle, Principle of inclusion- exclusion, Recurrence Relations, Generating Functions	
<b>UNIT IV</b>	<b>MODELING COMPUTATION AND LANGUAGES</b>	<b>9</b>
	Finite state machines – Deterministic and Non- deterministic finite state machines – Formal Languages – Classes of Grammars –Context Sensitive – Context Free – Regular Grammars.	
<b>UNIT V</b>	<b>GRAPHS</b>	<b>9</b>
	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, 1<sup>st</sup> Edition 2017.
2. K. H. Rosen, "Discrete Mathematics and its Applications", McGraw Hill Publishers, 5<sup>th</sup> Edition, 2003.
3. R. P. Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Publishers, 5<sup>th</sup> Edition, 2006.
4. T. Veerarajan, "Discrete Mathematics", McGraw Hill Publishers, 13<sup>th</sup> Reprint 2011.



**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

<b>UNIT I</b>	<b>ROLE OF ALGORITHMS IN COMPUTING</b> 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	<b>9</b>
<b>UNIT II</b>	<b>HIERARCHICAL DATA STRUCTURES</b> 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.	<b>9</b>
<b>UNIT III</b>	<b>GRAPHS</b> 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;	<b>9</b>
<b>UNIT IV</b>	<b>ALGORITHM DESIGN TECHNIQUES</b> 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.	<b>9</b>
<b>UNIT V</b>	<b>NP COMPLETE AND NP HARD</b> NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP-Completeness and Reducability – NP-Completeness Proofs – NP-Complete Problems	<b>9</b>

**Total: 45**

## 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 Edition 2017.
6. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, Fundamentals of Data Structures in C, Universities Press; Second edition, 2008.

**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

<b>UNIT I</b>	<b>FOUNDATIONS OF NETWORKING</b> 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.	<b>9</b>
<b>UNIT II</b>	<b>QUALITY OF SERVICE</b> 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	<b>9</b>
<b>UNIT III</b>	<b>NEXT GENERATION NETWORKS</b> 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.	<b>9</b>
<b>UNIT IV</b>	<b>SOFTWARE DEFINED NETWORKING</b> Evolution of SDN -Control Plane - Control and data plane separation - Network Virtualization - Data Plane - Programming SDNs - Verification and Debugging - openflow networks.	<b>9</b>
<b>UNIT V</b>	<b>NGN ARCHITECTURE</b> 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	<b>9</b>

**Total: 45**

## 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 Gurtoy, 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 Playvyk, "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

**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 SEARCH 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**

## 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.

**P19CSE105**

**ADVANCED DATA STRUCTURES AND  
ALGORITHMS LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Marks</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>100</b>

**COURSE OUTCOMES**

**At the end of experiments, 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

**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.

**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

**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 IPcommand, 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 theEXIT 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.



**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

**UNIT 1 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 2 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 3 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 4 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 5 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

**THEORY: 30 Hours**

**TUTORIAL: -**

**PRACTICAL: -**

**TOTAL: 30 Hours**

## **TEXT BOOKS**

1. C.R. Kothari, Gaurav Garg, Research Methodology Methods and Techniques ,4<sup>th</sup> Edition, New Age International Publishers, 2019.
2. Deborah E. Bouchoux, “Intellectual Property: The Law of Trademarks, Copyrights, Patents, and Trade Secrets”, Delmar Cengage Learning, 4<sup>th</sup> Edition, 2012.
3. Prabuddha Ganguli, “Intellectual Property Rights: Unleashing the Knowledge Economy”, Tata Mc Graw Hill Education, 1<sup>st</sup> 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, 4<sup>th</sup> edition, Sage publisher, 2014.
3. D Llewelyn & T Aplin W Cornish, “Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights”, Sweet and Maxwell, 1<sup>st</sup> Edition, 2016.
4. Ananth Padmanabhan, “Intellectual Property Rights-Infringement and Remedies”, Lexis Nexis, 1<sup>st</sup> Edition, 2012.
5. Ramakrishna B and Anil Kumar H.S, “Fundamentals of Intellectual Property Rights: For Students, Industrialist and Patent Lawyers”, Notion Press, 1<sup>st</sup> Edition, 2017.
6. M.Ashok Kumar and Mohd.Iqbal Ali :”Intellectual Property Rights” Serials Pub

**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**

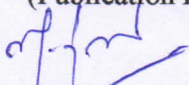
Moralisation of Desire & practice- Punctuality-Love-Kindness-Compassion Eradication of worries-Practice -Personality development, positive thinking-Good characters to lead a moral life

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

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2	P19CSE202	Machine Learning	3	0	0	3	45
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5	P19CSE506	<b>Elective</b> -Software Testing	3	0	0	3	45
6	P19GE701	<b>Audit Course</b> -English for Research Paper Writing	2	0	0	0	30
<b>Practical</b>							
7	P19CSE203	Advanced Database Laboratory	0	0	4	2	60
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<b>Total Credits</b>						<b>19</b>	

**Approved by**

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**Dr.B.Sathiyabhama**

**Member Secretary, Academic Council**  
**Dr.R.Shivakumar**

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

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

**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

**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-Distributive 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 Concepts", Sixth Edition, McGrawHill
- 2) Guy Harrison, "Next Generation Databases", Apress, 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

**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

**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. Ethem Alpaydin, "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. 2016 Tom 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

**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

**Total: 60**



**COURSE OUTCOMES**

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

- Appreciate the evolution and applications of IoT
- Identify suitable/appropriate sensors for an application and understand circuits
- Analyze different options for Embedded systems, connectivity and networking protocol and apply the appropriate one for a given application
- Examine the important aspects of IoT architectures and write programs for Arduino and Raspberry Pi
- Identify the security issue and solve the issues

**UNIT I****9****IOT – MOTIVATION AND APPLICATIONS**

Importance of IoT. Motivating Applications of IoT: Smart Cities- Smart Waste Management, Smart Street Lights, Smart Street Parking, Security without Surveillance, Connected Vehicles. Healthcare- Baby Monitoring, Elderly Monitoring, Mood Enhancing, Disease Treatment and Progression Monitoring, Enhance Adherence, Challenges. Agriculture- Precision Agriculture, Connected Livestock, Food Safety. Manufacturing and Logistics- Smart Manufacturing- Smart Packaging, Smart Label. Smart Electricity Grid- Managing Supply and Demand. Home Automation.

**UNIT II****SENSORS AND CIRCUITS****8**

Sensor – Introduction, Terminology, Behavior, Selection, Circuits – Overview and Applications, Battery Issue and Energy Management, Wireless Link, Digital and Analog – Digital Computing, Analog to Digital Interfaces

**UNIT III****9****EMBEDDED SYSTEMS, CONNECTIVITY AND NETWORKING**

Embedded Systems – Overview, Technology Drivers, Energy, Microcontrollers, Software Connectivity and Networking – Introduction, Connectivity Challenges in IoT, Energy Harvesting Transmitters, Massive Multiple Access, Computation vs Communication

**UNIT IV****ARCHITECTURE AND PROGRAMMING****9**

IoT Architectures – embedded System, Gateway and Cloud (MGC) Architecture and other reference models and architectures Arduino vs Raspberry Pi vs Electric Imp – Key features and comparisons Arduino Interfaces – Arduino IDE – Programming

**IOT CHALLENGES AND SECURITY STANDARDS**

Technology Challenges – Security, Connectivity, Compatibility and Longevity, Standards, Intelligent Analysis and Actions .IoT Society Challenges – Privacy, Regulatory Standards -IoT security lifecycle - Cloud services and IoT – offerings related to IoT from cloud service providers – Cloud IoT security controls – An enterprise IoT cloud security architecture – New directions in cloud enabled IoT computing

**Total: 45****REFERENCE BOOKS**

1. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
2. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", John Wiley & Sons Ltd., UK, 2014.
3. "Internet of Things: A Hands-on Approach", by ArshdeepBahga and Vijay Madisetti (Universities Press)
4. Dieter Uckelmann, Mark Harrison and Florian Michahelles, "Architecting the Internet of Things", Springer, NewYork, 2011
5. Olivier Hersent, David Boswarthick and OmarElloumi, "The Internet of Things: Key Applications and Protocols", John Wiley & Sons Ltd., UK, 2012.
6. B. Rusell and D. Van Duren, "Practical Internet of Things Security," Packet Publishing, 2016.

**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)

**Total: 60**

**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

**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.

**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

**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
- William E. Perry, “Effective methods for software testing”, 2nd Edition, John Wiley, 2000

# Audit Course

P19GE701

English for Research Paper Writing

2000

## 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

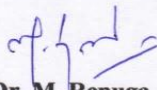
Usage of appropriate phrases and key terms to make the writing effective - proof-reading to ensure error-free writing.

## **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



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

**Total: 30 hours**

**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
<b>Theory</b>							
1	P19CSE505	<b>Elective-</b> Network Security	3	0	0	0	45
2	P19CSE507	<b>Elective-</b> Natural Language Processing	3	0	0	0	45
3	P19CEM601	<b>Open Elective-</b> Disaster Mitigation and Management	3	0	0	3	45
<b>Practical</b>							
4	P19CSE301	Project Work Phase - I	0	0	16	8	240
<b>Total Credits</b>						<b>17</b>	

**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



**COURSE OUTCOMES**

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

- Compare the various models in morphology
- Analyze the various techniques used in syntactic analysis
- Compare the various parsing techniques in context free grammar
- Analyze the various the semantic analysis techniques
- Analyze the various techniques for language generation and disclosure analysis

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	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	1	2	1	3	1	3	2	3	3	3	2	2	3
CO2	3	3	2	3	3	2	2	2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO4	3	3	2	3	2	2	3	2	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	2	3	3	3	3	3	3	3	3

**UNIT I OVERVIEW AND MORPHOLOGY**

9

Introduction – Models -and Algorithms -Regular Expressions Basic Regular Expression Patterns – Finite State Automata. Morphology -Inflectional Morphology - Derivational Morphology. Finite-State Morphological Parsing --Porter Stemmer

**UNIT II WORD LEVEL AND SYNTACTIC ANALYSIS**

9

N-grams Models of Syntax - Counting Words - Unsmoothed N-grams. Smoothing- Backoff Deleted Interpolation – Entropy - English Word Classes - Tagsets for English. Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging

**UNIT III CONTEXT FREE GRAMMARS**

9

Context Free Grammars for English Syntax- Context-Free Rules and Trees. Sentence- Level Constructions– Agreement – Sub Categorization. Parsing – Top-down – Earley Parsing -feature Structures – Probabilistic Context-Free Grammars

**UNIT IV SEMANTIC ANALYSIS****9**

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus. Representing Linguistically Relevant Concepts -Syntax-Driven Semantic Analysis - Semantic Attachments -Syntax-Driven Analyzer. Robust Analysis - Lexemes and Their Senses - Internal Structure -Word Sense Disambiguation - Information Retrieval

**UNIT V LANGUAGE GENERATION AND DISCOURSE ANALYSIS****9**

Discourse -Reference Resolution - Text Coherence -Discourse Structure – Coherence. Dialog and Conversational Agents - Dialog Acts – Interpretation -Conversational Agents. Language Generation – Architecture -Surface Realizations - Discourse Planning. Machine Translation -Transfer Metaphor–Interlingua – Statistical Approaches

**Total: 45****REFERENCE BOOKS**

1. Gerald J. Kowalski , Mark T. Maybury , “ Information Storage And Retrieval Systems Theory and Implementation”, Second Edition , Kluwer Academic Publishers
2. Daniel Jurafsky and James H Martin, ”Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Prentice Hall, 2nd Edition, 2008
3. C. Manning and H. Schutze, “Foundations of Statistical Natural Language Processing”, MIT Press Cambridge, MA:,1999
4. Tomek Strzalkowski “ Natural Language Information Retrieval “, Kluwer academic Publishers,1999

**COURSE OUTCOMES**

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

- Compare the various conventional encryption algorithms
- Apply number theory in public key encryption schemes to encrypt messages
- Analyze the various authentication algorithms and Hash functions
- Analyze the various the network security tools and applications
- Analyze the various techniques to protect the system from security threats and viruses

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	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO3
CO 1	3	3	2	2	1	3	1	2	2	2	3	3	2	2	3
CO 2	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO 3	3	3	3	3	3	2	2	3	3	2	2	3	3	3	3
CO 4	3	3	3	3	3	2	3	3	3	3	3	3	3	3	3
CO 5	2	3	3	3	3	3	3	3	3	3	3	2	3	3	3

**UNIT I INTRODUCTION 9**

OSI Security Architecture - Classical Encryption techniques - Cipher Principles - Data Encryption Standard - Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES - AES Cipher – Triple DES - Placement of Encryption Function - Traffic Confidentiality

**UNIT II PUBLIC KEY CRYPTOGRAPHY 9**

Introduction to Number Theory - Confidentiality using Symmetric Encryption - Public Key Cryptography and RSA - Key Management - Diffie-Hellman key Exchange - Elliptic Curve Architecture and Cryptography

<b>UNIT III</b>	<b>AUTHENTICATION AND HASH FUNCTION</b>	<b>9</b>
	Authentication requirements - Authentication functions - Message Authentication Codes - Hash Functions - Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm - RIPEMD - HMAC Digital Signatures -	
	Authentication Protocols - Digital Signature Standard	
<b>UNIT IV</b>	<b>NETWORK SECURITY</b>	<b>9</b>
	Authentication Applications: Kerberos - X.509 Authentication Service - Electronic Mail Security - PGP - S/MIME - IP Security - Web Security	
<b>UNIT V</b>	<b>SYSTEM LEVEL SECURITY</b>	<b>9</b>
	Intrusion detection - password management - Viruses and related Threats - Virus Counter measures – Firewall Design Principles - Trusted Systems	

**Total: 45**

**REFERENCE BOOKS**

1. S. Bose, P. Vijayakumar, "Cryptography and Network Security", Pearson India, 1st Edition, 2017
2. William Stallings, "Cryptography and Network Security: Principles and Practice", 6th Edition, PHI, 2014.
3. Wenbo Mao, "Modern cryptography: Theory and Practice", HP / PHI, 2003
4. Atul Kahate, "Cryptography and Network Security", third edition, Tata McGraw-Hill, 2013.
5. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2015  
Charles B. Pfleeger, Shari Lawrence Pfleeger, "Analyzing Computer security", Third Edition, pearson Education, 2012

**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**

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

**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, Fourth Semester ME CSE Students and Staff, COE