# 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 2019-2020]**

**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 |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 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 | **Audit Course-**Stress Management by Yoga | 2 | 0 | 0 | 0 |
| **Practical** | | | | | | |
| 7 | P19CSE105 | Advanced Data Structures and Algorithms Laboratory | 0 | 0 | 4 | 2 |
| 8 | P19CSE106 | Network Programming Laboratory | 0 | 0 | 4 | 2 |
| | | | | | **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**

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**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 |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 1 | P19CSE201 | Advanced Databases | 3 | 0 | 0 | 3 |
| 2 | P19CSE202 | Machine Learning | 3 | 0 | 0 | 3 |
| 3 | P19CSE507 | **Elective** - Natural Language Processing | 3 | 0 | 0 | 3 |
| 4 | P19CSE508 | **Elective** - Internet of Things | 3 | 0 | 0 | 3 |
| 5 | P19CSE510 | **Elective** - Data Warehousing and Data Mining | 3 | 0 | 0 | 3 |
| 6 | P19GE701 | **Audit Course** - English for Research Paper Writing | 2 | 0 | 0 | 0 |
| **Practical** | | | | | | |
| 7 | P19CSE203 | Advanced Database Laboratory | 0 | 0 | 4 | 2 |
| 8 | P19CSE204 | Machine Learning Laboratory | 0 | 0 | 4 | 2 |
| | | | | | **Total Credits** | **19** |

**Approved by**

**Chairperson, Computer Science and Engineering BOS**
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**Sona College of Technology, Salem**
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**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 |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 1 | P19CSE511 | **Elective**- Bio Informatics | 3 | 0 | 0 | 3 |
| 2 | P19CSE513 | **Elective**- Big Data Analytics | 3 | 0 | 0 | 3 |
| 3 | P19CEM601 | **Open Elective –** Disaster Mitigation and Management | 3 | 0 | 0 | 3 |
| | P19ISE601 | **Open Elective –** Transport Safety | | | | |
| **Practical** | | | | | | |
| 4 | P19CSE301 | Project Work Phase - I | 0 | 0 | 16 | 8 |
| | | | | | **Total Credits** | **17** |

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**Sona College of Technology, Salem**
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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 |
|---|---|---|---|---|---|---|
| **Practical** | | | | | | |
| 1 | P19CSE401 | Project Work Phase – II | 0 | 0 | 28 | 14 |
| | | | | | **Total Credits** | **14** |

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| **Chairperson, Computer Science and Engineering BOS** | **Member Secretary, Academic Council** | **Chairperson, Academic Council & Principal** |
|---|---|---|
| **Dr.B.Sathiyabhama** | **Dr.R.Shivakumar** | **Dr.S.R.R.Senthil Kumar** |

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**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 |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 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 | **Audit Course-**Stress Management by Yoga | 2 | 0 | 0 | 0 |
| **Practical** | | | | | | |
| 7 | P19CSE105 | Advanced Data Structures and Algorithms Laboratory | 0 | 0 | 4 | 2 |
| 8 | P19CSE106 | Network Programming Laboratory | 0 | 0 | 4 | 2 |
| | | | | | **Total Credits** | **18** |

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| P19CSE101 | MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE | L | T | P | C | Marks |
|---|---|---|---|---|---|---|
| | | 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 | 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. 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

**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**

**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

**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**

## 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

**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**

**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 | L | T | P | C | Marks |
|---|---|---|---|---|---|---|
| | | 0 | 0 | 4 | 2 | 100 |

**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.

| 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

**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.

**P19GE101 RESEARCH METHODOLOGY AND IPR 2 0 0 2**

## 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 ,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.

**REFERENCE BOOKS**


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

**P19GE702** **Stress Management by Yoga**

**2 0 0 0**

## 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. Acceleratememory 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- 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 hours**

**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 (Publication Department), Kolkata

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**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 |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 1 | P19CSE201 | Advanced Databases | 3 | 0 | 0 | 3 |
| 2 | P19CSE202 | Machine Learning | 3 | 0 | 0 | 3 |
| 3 | P19CSE507 | **Elective** - Natural Language Processing | 3 | 0 | 0 | 3 |
| 4 | P19CSE508 | **Elective** - Internet of Things | 3 | 0 | 0 | 3 |
| 5 | P19CSE510 | **Elective** - Data Warehousing and Data Mining | 3 | 0 | 0 | 3 |
| 6 | P19GE701 | **Audit Course** - English for Research Paper Writing | 2 | 0 | 0 | 0 |
| **Practical** | | | | | | |
| 7 | P19CSE203 | Advanced Database Laboratory | 0 | 0 | 4 | 2 |
| 8 | P19CSE204 | Machine Learning Laboratory | 0 | 0 | 4 | 2 |
| | | | | | **Total Credits** | **19** |

**Approved by**

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

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

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| 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

**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 Storage** **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 Databases** **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

**UNIT I** **9**

**INTRODUCTION**

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** **9**

**ADVANCED LEARNING**

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

**P19CSE507 NATURAL LANGUAGE PROCESSING**

| L | T | P | C | Marks |
|---|---|---|---|---|
| 3 | 0 | 0 | 3 | 100 |

## COURSE OUTCOMES

**At the end of each unit, 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

**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** **9**

**LANGUAGE GENERATION AND DISCOURSE ANALYSIS**

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

| P19CSE508 | INTERNET OF THINGS | L | T | P | C | Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

**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

**UNIT V** **10**

**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.

**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

**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
8. G Dong and J Pei, Sequence Data Mining, Springer, 2007.

| 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)

# Audit Course

**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**

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

**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 |
|---|---|---|---|---|---|---|
| **Theory** | | | | | | |
| 1 | P19CSE511 | **Elective**- Bio Informatics | 3 | 0 | 0 | 3 |
| 2 | P19CSE513 | **Elective**- Big Data Analytics | 3 | 0 | 0 | 3 |
| 3 | P19CEM601 | **Open Elective –** Disaster Mitigation and Management | 3 | 0 | 0 | 3 |
| | P19ISE601 | **Open Elective –** Transport Safety | | | | |
| **Practical** | | | | | | |
| 4 | P19CSE301 | Project Work Phase - I | 0 | 0 | 16 | 8 |
| | | | | | **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

| P19CSE511 | BIOINFORMATICS | L | T | P | C | Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

## COURSE OUTCOMES

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

- Deploy the genomics technologies in Bioinformatics
- Analyze various efficient algorithm and issues
- Deploy the replication and molecular clocks in bioinformatics
- Apply Work on assemble genomes and sequences
- Apply the Microarray technologies for genome expression

**UNIT I INTRODUCTION AND FUNDAMENTALS** 9

Fundamentals of genes , genomics , molecular evolution – genomic technologies – beginning of bioinformatics - genetic data –sequence data formats – secondary database – examples – data retrieval systems – genome browsers.

**UNIT II BIOINFORMATICS ALGORITHM AND ANALYSIS 9**

Sequence alignment and similarity searching in genomic databases: BLAST and FASTA – additional bioinformatics analysis involving nucleic acid sequences-additional bioinformatics analysis involving protein sequences – Phylogenetic Analysis

**UNIT III DNA REPLICATION AND MOLECULAR CLOCKS 9**

Beginning of DNA replication – open problems – multiple replication and finding replication – computing probabilities of patterns in a string-the frequency array-converting patternssolving problems- finding frequents words-Big-O notation –case study-The Tower of Hanoi problem

**UNIT IV ASSEMBLE GENOMES AND SEQUENCES 9**

Methods of assemble genomes – string reconstruction – De Bruijn graph – Euler‘s theorem – assembling genomes –DNA sequencing technologies – sequence antibiotics – Brute Force Algorithm – Branch and Bound algorithm – open problems – comparing biological sequences- Case Study –Manhattan tourist Problem

**UNIT V HUMAN GENOME** 9

Human and mouse genomes-random breakage model of chromosome evolution – sorting by reversals – greedy heuristic approach – break points- rearrangements in tumor and break point genomes-break point graps- synteny block construction -open problems and technologies

**Total: 45**

## REFERENCES


1. Ion Mandoiu and Alexander Zelikovsky , “Computational Methods for Next Generation Sequencing Data Analysis ― Wiley series 2016
2. Istvan Miklos,Renyi Institutue, ―Introduction to algorithms in bioinformatics‖,Springer 2016
3. Philip Compeau and Pavel pevzner, ―Bioinformatics Algorithms: An Active Learning Approach‖ Second edition volume I , Cousera, 2015
4. Supratim Choudhuri, ―Bioinformatics For Beginners‖, Elsevier, 2014

| P19CSE513 | BIG DATA ANALYTICS | L | T | P | C | Marks |
|---|---|---|---|---|---|---|
| | | 3 | 0 | 0 | 3 | 100 |

## COURSE OUTCOMES

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

- Deploy the data analytics lifecycle to address big data analytics projects
- Writing R programs for various applications
- Apply appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights that can lead to actionable results
- Use R and RStudio, MapReduce / Hadoop tools to perform in-database analytics
- Design various applications by selecting appropriate data visualizations to clearly communicate analytic insights to business sponsors and analytic audiences

**UNIT I INTRODUCTION TO BIG DATA ANALYTICS 10**

Big Data Overview - State of the Practice in Analytics - The Data Scientist - Big Data Analytics in Industry Verticals. Data Analytics Lifecycle – Discovery - Data Preparation - Model Planning - Model Building - Communicating Results – Operationalizing

**UNIT II REVIEW OF BASIC DATA ANALYTIC METHODS USING R** 9

Using R to Look at Data – Introduction to R - Analysing and Exploring the Data - Statistics for Model Building and Evaluation

**UNIT III ADVANCED ANALYTICS – THEORY AND METHODS 9**

K Means Clustering - Association Rules - Linear Regression - Logistic Regression - Naïve Bayesian Classifier - Decision Trees - Time Series Analysis - Text Analysis

**UNIT IV ADVANCED ANALYTICS - TECHNOLOGIES AND TOOLS** 9

Analytics for Unstructured Data - Map Reduce and Hadoop - The Hadoop Ecosystem, In-database Analytics – SQL Essentials - Advanced SQL and MADlib for In-database Analytics

**UNIT V THE ENDGAME OPERATIONALZING AN ANALYTICS PROJECT 9**

Creating the Final Deliverables - Data Visualization Techniques – Case Studies

**Total: 45**

## REFERENCE BOOKS


1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Educational Services, January 2015
2. Ken W.Collier,"AgileAnalytics:A value driven Approach to Business Intelligence and DataWarehousing", Pearson Education ,2012.
3. Donald Miner,"MapReduce Design Patterns" O'Reilly ,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**

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

**Approved by**

| **Chairperson, Computer Science and Engineering BOS** | **Member Secretary, Academic Council** | **Chairperson, Academic Council & Principal** |
|---|---|---|
| **Dr.B.Sathiyabhama** | **Dr.R.Shivakumar** | **Dr.S.R.R.Senthil Kumar** |

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