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 2018-2019]

M.E / M.Tech Regulation 2015

Approved by BOS and Academic Council meetings

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME I Semester under Regulations 2015
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15CSE101	Graph Theory and Combinatorics	3	2	0	4
2	P15CSE102	Advanced Data Structures and Algorithms	3	0	0	3
3	P15CSE103	Advanced Operating Systems	3	0	0	3
4	P15CSE104	Network Engineering and Management	3	0	0	3
5	P15CSE105	Advanced Computer Architecture	3	0	0	3
Practical						
6	P15CSE106	Advanced Programming Laboratory	0	0	2	1
7	P15CSE107	Computer Networks Laboratory	0	0	2	1
8	P15CSE108	Soft skills	0	0	2	1
					Total Credits	**19**

Approved by

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

Member Secretary, Academic Council
Dr.R.Shivakumar

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

Copy to:-
HOD/CSE, 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 2015
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15CSE201	Advanced Databases	3	0	0	3
2	P15CSE202	Mobile And Pervasive Computing	3	2	0	4
3	P15CSE203	Security In Computing	3	0	0	3
4	P15CSE204	Software Testing	2	0	2	3
5	P15CSE515	**Elective-** Natural Language Processing and Information Retrieval	3	0	0	3
Practical						
6	P15CSE205	Database Technology Laboratory	0	0	2	1
7	P15CSE206	Open Source Systems Laboratory	0	0	2	1
8	P15CSE207	Technical Seminar	0	0	2	1
					Total Credits	**19**

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Courses of Study for ME III Semester under Regulations 2015
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15CSE301	Data Science and Big Data Analytics	3	0	0	3
2	P15CSE302	Internet of Things	3	0	0	3
3	P15CSE519	**Elective**- Data Warehousing and Datamining	3	0	0	3
4	P15CSE526	**Elective –** Cloud Computing	3	0	0	3
Practical						
5	P15CSE303	Project Phase -I	0	0	12	6
					Total Credits	**18**

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Courses of Study for ME IV Semester under Regulations 2015
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Practical						
1	P15CSE401	Project Phase – II	0	0	24	12
					Total Credits	**12**

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Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15CSE101	Graph Theory and Combinatorics	3	2	0	4
2	P15CSE102	Advanced Data Structures and Algorithms	3	0	0	3
3	P15CSE103	Advanced Operating Systems	3	0	0	3
4	P15CSE104	Network Engineering and Management	3	0	0	3
5	P15CSE105	Advanced Computer Architecture	3	0	0	3
Practical						
6	P15CSE106	Advanced Programming Laboratory	0	0	2	1
7	P15CSE107	Computer Networks Laboratory	0	0	2	1
8	P15CSE108	Soft skills	0	0	2	1
					Total Credits	**19**

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P15CSE101 GRAPH THEORY AND COMBINATORICS L T P C 3 2 0 4

COURSE OUTCOMES:

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

- Discuss the concepts of set theory, principle of inclusion and exclusion ,relations and describe the concepts of permutations and combinations using binomial and multinomial theorems
- Explain the concept of recurrence relations,solve the homogenous and in homogenous recurrence relations by method of substitution and genetating function
- Define the graph and explain their behavior ,calculate the shortest path and minimal spanning tree by using algorithms.
- Discuss the matching and connectivity of a graphand explain the network flow problems.
- Discuss the coloring and chromatic number of a graph, Euler's formula. Explain planar graphs and parameters of planarity

UNIT I COMBINATORICS 15

Sets- Relations- Proof methods- Problem-solving strategies-Mathematical Induction- Basics of counting-Combinations and Permutations- Enumeration of Combinations and Permutations ,Enumeration of Combinations and Permutations without repetitions - with constrained repetitions-Binomial Coefficients-Binomial and Multinomial theorems- Principle of Inclusion-Exclusion

UNIT II RECURRENCE RELATIONS 15

Generating Functions of Sequences- Calculating Coefficients of Generating Functions- Recurrence Relations-Solving Recurrence Relations by Substitution and Generating Functions-Method of Characteristic Roots-Solutions of homogeneous and inhomogeneous recurrence relations.

UNIT III GRAPH THEORY 15

Fundamental concepts on Graph -Paths-Cycles-Trails-Vertex Degrees and Counting-Directed Graphs-Trees and Distance- Shortest path algorithm(Dijkstra's&Warshall's algorithm) -Spanning Trees-Enumeration-Optimization and Trees(Prim's&Kurskal's algorithm).

UNIT IV MATCHINGS AND CONNECTIVITY 15

Matchings and Coverings-Algorithms and applications of matching- Matchings in General graphs-Cuts and Connectivity-k-connected graphs-Network flow problems, 1-isomorphism, 2-isomorphism.

UNIT V COLORING AND PLANAR GRAPHS 15

Vertex coloring and upper bounds-Structure of Chromatic Graphs-Enumerative Aspects-Embeddings and Euler's formula-Characterization of Planar graphs-Parameters of Planarity-Edges and Cycles-Line Graphs and edge-coloring-Hamiltonian Cycles.

Note: From Unit I to Unit V – Theorem providing is not part of the syllabus. Only applications of theorems (problem solving) are considered.

Total : 75 hours

REFERENCE BOOKS:

1. Graph Theory with Applications to Engineering and Computer Science, Narasingh Deo, PHI.
2. J.L. Mott, Abraham Kandel & Theodore P. Baker, "Discrete mathematics for Computer Scientists & Mathematics", Prentice-Hall of India Ltd. New Delhi. (Chapters 1,2,3)
3. Douglas B. West, "Introduction to Graph Theory", Pearson Education Asia, New Delhi. (Chapters 1, 2, 3, 4, 5, 6, 7)
4. Michel Townsend, "Discrete Mathematics: Applied Combinatorics and graph theory", The Benjamin/Cummings Publishing Company", California.
5. Robin J. Wilson, "Introduction to Graph Theory" Pearson Education Asia, New Delhi.

P15CSE102 ADVANCED DATA STRUCTURES AND ALGORITHMS L T P C 3 0 0 3

COURSE OUTCOMES:

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

- Analyze algorithms and to determine algorithm correctness and time efficiency class.
- Master a variety of advanced data structures and their implementations.
- Apply search data structures and its implementation to solve problems
- Master different algorithm design techniques in computational geometry and in parallel algorithms.
- Apply and implement learned algorithm design techniques and data structures to solve problems.

UNIT I FUNDAMENTALS

9

Mathematical Induction - Asymptotic Notations – Properties of Big-oh Notation – Conditional Asymptotic Notation – Algorithm Analysis – Amortized Analysis – NP Completeness – NP-Hard – Recurrence Equations – Solving Recurrence Equations – Memory Representation of Multi-dimensional Arrays – Time-Space Tradeoff.

UNIT II HEAP STRUCTURES

9

Min/Max heaps – Deaps – Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps – Lazy-Binomial Heaps.

UNIT III SEARCH STRUCTURES

9

Binary Search Trees – AVL Trees – Red-Black trees – Multi-way Search Trees –B-Trees – Splay Trees – Tries.

UNIT IV MULTIMEDIA STRUCTURES

9

Segment Trees – k-d Trees – Point Quad Trees – MX-Quad Trees – R-Trees – TV Trees.

UNIT V PARALLEL ALGORITHMS

9

Flynn's Classifications – List Ranking – Prefix computation – Array Max – Sorting on EREW PRAM –Sorting on Mesh and Butterfly – Prefix sum on Mesh and Butterfly – Sum on mesh and butterfly – Matrix Multiplication – Data Distribution on EREW, Mesh and Butterfly.

Total: 45 hours

REFERENCE BOOKS:

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, Uiversity Press, 2007.
2. V.S. Subramanian, "Principles of Multimedia Database systems", Morgan Kaufman, 1998.
3. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, "Computational Geometry Algorithms and Applications", Third Edition, 2008
4. James A. Storer, "An Introduction to Data Structures and Algorithms", Springer, New York, 2002.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein "Introduction to Algorithms", 2009

P15CSE103 ADVANCED OPERATING SYSTEMS L T P C 3 0 0 3

COURSE OUTCOMES:

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

- Analyse theory and implementation of: processes, resource control and process scheduling
- Analyse theory and implementation of: physical and virtual memory, I/O and files
- describe, contrast and compare differing structures for operating systems
- analyze the various algorithms used for mutual exclusion in distributed systems
- describe and analyze the design of modern operating systems

UNIT I PROCESS MANAGEMENT

9

Operating system and services - Process structure and PCB - Threads – Inter process communication – CPU scheduling approaches - Process synchronization — Deadlocks.

UNIT II MEMORY AND FILE MANAGEMENT

9

Memory management- Paging- Segmentation-Virtual memory- Demand paging – Page replacement algorithms- File systems – Access methods – Directory structure and implementation– File system mounting – File sharing – Protection - File System structure and implementation – Allocation methods.

UNIT III DISTRIBUTED OPERATING SYSTEM

9

System Architecture- Issues in Distributed OS – Communication Primitives – Distributed Mutual Exclusion- classification of mutual exclusion – Non-token based algorithm – Token based algorithm- comparative performance analysis- Distributed Deadlock- Deadlock handling strategies- Issues – control organization – centralized deadlock detection algorithm – Distributed deadlock detection algorithm.

UNIT IV DISTRIBUTED SCHEDULING AND MEMORY

9

Distributed scheduling- Issues in load distributing – component – stability- load distributing – performance comparison Distributed shared memory- Architecture and motivation – Algorithms – memory – coherence protocols – design issues- Distributed file system – Architecture- mechanism – design issues - case study

UNIT V REAL TIME AND MOBILE OPERATING SYSTEMS

9

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems –Micro Kernel Design - Architecture- Memory Management – Case studies.

Total: 45 hours

REFERENCE BOOK

1. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, Ninth Edition, John Wiley & Sons, 2012.
2. M Singhal and NG Shivaratri , Advanced Concepts in Operating Systems, Tata McGrawHill Inc, 2001
3. Andrew Tannenbaum and Maarten van Steen, Distributed Systems: Principles and Paradigms 2nd edition, Pren Pearson Education India, 2007
4. Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, 2007.
5. S. Tarkoma and E. Lagerspetz, "Arching over the Mobile Computing Chasm: Platforms and Runtimes", IEEE Computer, Volume 44, (2011), pages 22–28.

P15CSE104 NETWORK ENGINEERING AND MANAGEMENT L T P C 3 0 0 3

COURSE OUTCOMES:

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

- Comprehend the basic concepts of networking
- Analyze the various characteristics of network and transport layers
- Analyze the various network design strategies
- Test the various network design strategies
- Analyze the working principle and performance of various network management protocols.

UNIT I FOUNDATIONS OF NETWORKING **9**

Introduction to networks: Definition of layers, services, interfaces and protocols – OSI reference model – **Physical layer:** Networking elements, Multiplexing, Switching – **Data link Layer:** Framing, Flow control, Error Control, Channel Access: SDMA, FDMA, TDMA and CDMA.

UNIT II ROUTING AND QUALITY of SERVICE **9**

Network Layer: Addressing: IPv4, IPv6 - Routing Protocols: RIP, OSPF and BGP - QoS: Integrated and Differentiated Services. **Transport Layer:** TCP header, TCP Flow Control and TCP congestion control

UNIT III NETWORK DESIGN **9**

Analyzing top-down network design methodologies, technical goals and tradeoffs – scalability, reliability, availability, Network performance, security, Characterizing the existing internetwork, characterizing network traffic, developing network security strategies.

UNIT IV TESTING AND OPTIMIZING SYSTEM DESIGN **9**

Selecting technologies and devices for network design, testing network design – using industry tests, building a prototype network system, writing and implementing test plan, tools for testing, optimizing network design – network performance to meet quality of service (QoS)

UNIT V NETWORK MANAGEMENT **9**

SNMP– SNMPv2 and SNMPv3 – Remote monitoring – RMON SMI and MIB

Total: 45 hours

REFERENCE BOOKS:

1. Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fifth Edition, Morgan Kaufman Publishers, 2011.
2. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2012.
3. Priscilla Oppenheimer, "Top-Down network Design", Thrid edition, Cisco press, 2012. (UNIT III & IV).
4. William Stallings, 'High Speed Networks: Performance and Quality of Service', 2nd Edition, Pearson Education, 2002.
5. Mani Subramaniam, 'Network Management: Principles and Practices', Second Edition, Pearson Education, 2010. (UNIT V)

P15CSE105 ADVANCED COMPUTER ARCHITECTURE L T P C 3 0 0 3

COURSE OUTCOMES:

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

- Analyze the potential data hazards in the given code and suggest a way to eliminate them.
- Analyze the performance and efficiency in Multiple Issue Processor
- Discuss how cache coherence problems are overcome in directory-based protocols.
- Explain the architecture and compare SMT processors with multi-core processors
- Design a unique memory system based on the concepts studied.

UNIT I PIPELINING AND ILP **9**

Fundamentals of Computer Design - Measuring and Reporting Performance - Instruction Level Parallelism and Its Exploitation - Concepts and Challenges - Overcoming Data Hazards with Dynamic Scheduling – Dynamic Branch Prediction - Speculation - Multiple Issue Processors – Case Studies.

UNIT II TLP AND LIMITS OF ILP **9**

Compiler Techniques for Exposing ILP - Limitations on ILP for Realizable Processors - Hardware versus Software Speculation - Multithreading: Using ILP Support to Exploit Thread-level Parallelism - Performance and Efficiency in Advanced Multiple Issue Processors - Case Studies.

UNIT III MULTIPROCESSOR SYSTEMS **9**

Symmetric and distributed shared memory architectures – Cache coherence issues - Performance Issues – Synchronization issues – Models of Memory Consistency - Interconnection networks – Buses, crossbar and multi-stage switches.

UNIT IV MULTI-CORE ARCHITECTURES **9**

Introduction to Multicore Architecture –SMT and CMP architectures – Multicore Vs Multithreading– Case studies – Intel Multi-core architecture – SUN CMP architecture – IBM cell architecture.- hp architecture.

UNIT V MEMORY HIERARCHY DESIGN **9**

Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.

TOTAL:45 hours

REFERENCE BOOKS:

1. John L. Hennessey and David A. Patterson, " Computer Architecture – A quantitative approach", Morgan Kaufmann / Elsevier, 4th. edition, 2007.
2. Kai Hwang, "Advanced Computer Architecture: Parallelism, Scalability and Programmability" McGraw-Hill, 1(9)(9)3
3. William Stallings, "Computer Organization and Architecture – Designing for Performance", Pearson Education, Seventh Edition, 2006.

P15CSE106 ADVANCED PROGRAMMING LABORATORY L T P C 0 0 2 1

COURSE OUTCOMES:

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

- Implement multi-dimensional data structures and Exhaustive Search techniques.
- Implement the Tree Structures and Multimedia structures
- Implement Scheduling, Page-replacement and IPC

LIST OF EXPERIMENTS:

1. Implementation of multi-dimensional structures such as matrices, triangular matrices, diagonal matrices, etc into a one dimensional array (atleast any two)
2. Implementation of any two of the following Heap structures
   - Deaps (Insertion, Delete Min, Delete Max)
   - Leftist Heap (All Meldable Priority Queue operations)
   - Skew Heap (All Meldable Priority Queue operations)
   - Fibonacci Heap (All Meldable Priority Queue operations)
3. Implementation of any two of the following Search Structures
   - AVL Trees (Insertion, Deletion and Search)
   - Splay Trees (Insertion, Deletion and Search)
   - Tries for any specified alphabet (Insertion, Deletion and Search)
   - B-Trees (Insertion, Deletion and Search)
4. Implementation of any two of the following multimedia structures
   - 2-d Trees (Insertion, Deletion and Range Queries)
   - Point Quad-Trees (Insertion, Deletion and Range Queries)
   - Segment Trees (Insertion, Deletion – Show list of nodes where in insertion and deletion took place)
5. Finding Convex-hull.
6. Implementation of CPU Scheduling algorithms
   - FCFS
   - SJF
   - Priority
   - Round robin
7. Implementation of page replacement algorithms
   - FIFO
   - LRU
8. Inter-process communication using semaphores

TOTAL:30 hours

P15CSE507 COMPUTER NETWORKS LABORATORY L T P C 0 0 2 1

COURSE OUTCOMES:

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

- Simulate various LAN Topologies and MAC protocols and different routing protocols
- Simulate AODV in wireless environment
- Analyse the TCP congestion control mechanisms using ns2

LIST OF EXPERIMENTS

1. Create a LAN Network and compare the performance between MAC protocols using ns-2
2. Simulate DVR and LSR routing using ns-2
3. Create a wireless network environment with mobile nodes and transfer the data using AODV using ns-2
4. Create a TCP based network and trace the performance of Slow Start congestion control algorithm using ns-2
5. Filter the incoming packets based on IP address using "pcap" or "jpcap" library
6. Extract the network layer details of the incoming packets using "pcap" library.
7. Extract the MAC address of the incoming packet using "pcap" library.
8. 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.

   IP_client.py
   IP_client_2.py

TOTAL:30 hours

P15CSE108 SOFT SKILLS L T P C 0 0 2 1

COURSE OUTCOMES:
At the end of the course, students will be able to

- Goal setting and time and stress management that deals with criticism.
- Develop team work skills and leadership qualities.
- Analyze to prioritize, plan and delegate work.
- Develops good presentation skills, skills to discuss effectively in a group and in public.
- Demonstrate the interview techniques and manage the frequently asked questions

UNIT I

SWOT analysis and goal setting, Intra-personal skills, Interpersonal Skills,

Time Management, Stress Management, Dealing with Criticism

UNIT II

Team Work, Leadership skills, Prioritizing and Planning, and Delegation.

UNIT III

Presentations Skills, Group Discussion, Public Speaking skills.

UNIT IV

Career Planning, Resume Writing, Interview Techniques.

UNIT V

Etiquette and Manners: Workplace Etiquette, Grooming Etiquette, Social Etiquette, Table manners and Etiquette, E-Mail Etiquette.

Total : 30 hours

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Theory						
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2	P15CSE202	Mobile And Pervasive Computing	3	2	0	4
3	P15CSE203	Security In Computing	3	0	0	3
4	P15CSE204	Software Testing	2	0	2	3
5	P15CSE515	**Elective-** Natural Language Processing and Information Retrieval	3	0	0	3
Practical						
6	P15CSE205	Database Technology Laboratory	0	0	2	1
7	P15CSE206	Open Source Systems Laboratory	0	0	2	1
8	P15CSE207	Technical Seminar	0	0	2	1
					Total Credits	**19**

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P15CSE201 ADVANCED DATABASES L T P C 3 0 0 3

COURSE OUTCOMES

After successful completion of the course, the students would be able to

- Understand the difference between a distributed and "mobile" system and significance.
- Implement a simple object and object relational databases.
- Identify the security challenges faced by XML databases.
- Evaluate the distributed algorithms for locking, synchronization and concurrency, scheduling, and replication in a mobile database.
- Identify security issues handled in a multimedia database

UNIT I PARALLEL AND DISTRIBUTED DATABASES

9

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies**.**

UNIT II OBJECT AND OBJECT RELATIONAL DATABASES

9

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems : Object Relational featuresin SQL/Oracle – Case Studies.

UNIT III XML DATABASES

12

XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

UNIT IV MOBILE DATABASES

12

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Mobile Database Recovery Schemes

UNIT V MULTIMEDIA DATABASES

12

Multidimensional Data Structures – Image Databases – Text/Document Databases-Video Databases – Audio Databases – Multimedia Database Design.

Total :45 hours

REFERENCE BOOKS:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, “ Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan,”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
5. V.S.Subramanian, “Principles of Multimedia Database Systems”, Harcourt India Pvt Ltd., 2001.
6. Vijay Kumar, “ Mobile Database Systems”, John Wiley & Sons, 2006.

P15CSE202 MOBILE AND PERVASIVE COMPUTING LT P C 3 2 0 4

COURSE OUTCOMES:

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

- Apply the basic concepts and techniques of mobile computing to meet the requirements of the given scenario.
- Analyze the architectural advancement in cellular networks from 3G to 4G.
- Deploy sensor and mesh networks.
- Analyze the paradigms of context aware and wearable computing.
- Build mobile app for various platforms.

UNIT I INTRODUCTION **15**

Differences between Mobile Communication and Mobile Computing – Contexts and Names – Functions – Applications and Services – New Applications – Making Legacy Applications Mobile Enabled – Design Considerations – Integration of Wireless and Wired Networks – Standard Bodies – Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive Devices

UNIT II 3G AND 4G CELLULAR NETWORKS **15**

Migration to 3G Networks – IMT 2000 and UMTS – UMTS Architecture – User Equipment – Radio Network Subsystem – UTRAN – Node B – RNC functions – USIM – Protocol Stack – CS and PS Domains – IMS Architecture – Handover – 3.5G and 3.(9)G a brief discussion – 4G LAN and Cellular Networks – LTE – Control Plane – NAS and RRC – User Plane – PDCP, RLC and MAC – WiMax IEEE 802.16d/e – WiMax Internetworking with 3GPP

UNIT III SENSOR AND MESH NETWORKS **15**

Sensor Networks – Role in Pervasive Computing – In Network Processing and Data Dissemination – Sensor Databases – Data Management in Wireless Mobile Environments – Wireless Mesh Networks – Architecture – Mesh Routers – Mesh Clients – Routing – Cross Layer Approach – Security Aspects of Various Layers in WMN – Applications of Sensor and Mesh networks

UNIT IV CONTEXT AWARE COMPUTING & WEARABLE COMPUTING **15**

Adaptability – Mechanisms for Adaptation - Functionality and Data – Transcoding – Location Aware Computing – Location Representation – Localization Techniques – Triangulation and Scene Analysis – Delaunay Triangulation and Voronoi graphs – Types of Context – Role of Mobile Middleware – Adaptation and Agents – Service Discovery Middleware Health BAN- Medical and Technological Requirements-Wearable Sensors-Intra-BAN communications

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UNIT V APPLICATION DEVELOPMENT **15**

Three tier architecture - Model View Controller Architecture - Memory Management – Information Access Devices – PDAs and Smart Phones – Smart Cards and Embedded Controls – J2ME – Programming for CLDC – GUI in MIDP – Application Development ON Android and iPhone

TOTAL: 75 hours

REFERENCES:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", 2nd ed, Tata McGraw Hill, 2010.
2. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley,2010.
3. .Pei Zheng and Lionel M Li, 'Smart Phone & Next Generation Mobile Computing', Morgan Kaufmann Publishers, 2006.
4. Frank Adelstein, 'Fundamentals of Mobile and Pervasive Computing', TMH, 2005
5. Jochen Burthardt et al, 'Pervasive Computing: Technology and Architecture of Mobile Internet Applications', Pearson Education, 2003
6. Feng Zhao and Leonidas Guibas, 'Wireless Sensor Networks', Morgan Kaufmann Publishers, 2004
7. Uwe Hansmaan et al, 'Principles of Mobile Computing', Springer, 2003
8. Reto Meier, "Professional Android 2 Application Development", Wrox Wiley,2010.
9. Mohammad s. Obaidat et al, "Pervasive Computing and Networking",John wiley
10. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions", Wiley, 200(9)
11. Frank Adelstein Sandeep K. S. Gupta Golden G. Richard III

P15CSE203 SECURITY IN COMPUTING L T P C 3 0 0 3

COURSE OUTCOMES

After successful completion of the course, the students would be able to

- Implement encryption technique for secured data exchange.
- Analyze the threats, weakness and control mechanisms of program security.
- Identify the network security mechanism to handle secured data transmission.
- Manipulate data securely in databases.
- Analyze various security models and standards.

UNIT I ELEMENTARY CRYPTOGRAPHY

9

Terminology and Background – Substitution Ciphers – Transpositions – Making Good Encryption Algorithms- Data Encryption Standard- AES Encryption Algorithm – Public Key Encryption – Cryptographic Hash Functions – Key Exchange – Digital Signatures – Certificates

UNIT II PROGRAM SECURITY

9

Secure programs – Non-malicious Program Errors – Viruses – Targeted Malicious code – Controls Against Program Threat – Control of Access to General Objects – User Authentication – Good Coding Practices – Open Web Application Security Project Top 10 Flaws – Common Weakness Enumeration Top 25 Most Dangerous Software Errors

UNIT III SECURITY IN NETWORKS

9

Threats in networks – Encryption – Virtual Private Networks – PKI – SSH – SSL – IPSec – Content Integrity – Access Controls – Wireless Security – Honeypots – Traffic Flow Security – Firewalls – Intrusion Detection Systems – Secure e-mail.

UNIT IV SECURITY IN DATABASES

9

Security requirements of database systems – Reliability and Integrity in databases – Two Phase Update – Redundancy/Internal Consistency – Recovery – Concurrency/Consistency – Monitors – Sensitive Data – Types of disclosures – Inference.

UNIT V SECURITY MODELS AND STANDARDS

9

Secure SDLC – Secure Application Testing – Security architecture models – Trusted Computing Base – Bell-LaPadula Confidentiality Model – Biba Integrity Model – Graham-Denning Access Control Model – Harrison-Ruzzo-Ulman Model – Secure Frameworks – COSO – CobiT – Compliances – PCI DSS – Security Standards - ISO 27000 family of standards – NIST.

TOTAL: 45 hours

REFERENCES:

1. Charles P. Pfleeger, Shari Lawrence Pfleeger, “Security in Computing”, Fourth Edition, Pearson Education, 2007.

2. Matt Bishop, “Introduction to Computer Security”, Addison-Wesley, 2004.

3. Michael Whitman, Herbert J. Mattord, “Management of Information Security”, Third Edition, Course Technology, 2010.

4. William Stallings, “Cryptography and Network Security : Principles and Practices”, Fifth Edition, Prentice Hall, 2010.

5. Michael Howard, David LeBlanc, John Viega, “24 Deadly Sins of Software Security: Programming Flaws and How to Fix Them”, First Edition, Mc Graw Hill Osborne Media, 200(9).

6. Matt Bishop, “Computer Security: Art and Science”, First Edition, Addison-Wesley, 2002.

P15CSE204 SOFTWARE TESTING L T P C 2 0 2 3

COURSE OUTCOMES:

After successful completion of the course, the students would 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, CodeCover, and IBM Rational Functional Tester.
- Analyze the strengths and weaknesses of well-established testing techniques and select the appropriate ones for particular real-time projects.

UNIT I FUNDAMENTALS **12**

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 **12**

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 **12**

Metrics – What and Why – Linguistic Metrics – Structural Metrics – Hybrid Metrics – Metrics Implementation.

UNIT IV SYNTAX TESTING **12**

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 **12**

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

Total: 60 hours

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”, Pearson Education, 2004.
3. William E. Perry, “Effective methods for software testing”, 2nd Edition, John Wiley, 2000.

P15CSE205 DATABASE TECHNOLOGY LABORATORY L T P C 0 0 2 1

COURSE OUTCOMES:

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

- To use databases for building web applications.
- Know about the internals of a database system.
- Design and implement various scripting languages
- Design and implement web based applications
- Design and deploy database with various web applications

LIST OF EXPERIMENTS:

1. Administrating postgresql and PGAdmin3
2. Executing the Basic SQL commands
3. Execute the Intermediate SQL commands
4. Execute the Advanced SQL commands
5. Develop a Java application to Accessing Databases from Programs using JDBC
6. Develop a Web Applications using Servlets
7. Indexing and Query Processing
8. Big Data and Hadoop
9. Concurrency and Transaction Processing

TOTAL: 30 hours

P15CSE206 OPEN SOURCE SYSTEMS LABORATORY L T P C 0 0 2 1

COURSE OUTCOMES:

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

- Design a web page using HTML-5
- Validate the web pages using client side scripting
- Develop server side scripting
- Develop database connectivity web applications.
- Design and Develop web based projects

LIST OF EXPERIMENTS:

1. Web page development using HTML 5
2. Client side scripting using java script
3. Server side scripting using PHP
4. Database connectivity using MySQL and PHP
5. Project: Each student is assigned with a problem. The student is to develop a logical and physical database design for the problem and develop Forms, Menu design and Reports. Develop a web application, which connects with the database and perform queries or manipulations by using HTML, JavaScript, MySQL and PHP

   Sample Projects

   a. Electronics vendor database
   b. Package delivery database
   c. Retailer database
   d. Automobile sales database
   e. Real estate database

TOTAL: 30 hours

P15CSE207 TECHNICAL SEMINAR L T P C 0 0 2 1

THE OBJECTIVES OF TECHNICAL SEMINAR ARE:

1. To elicit pro-active participation of the students through
2. To entrust assignment to present
3. To inculcate presentation and leadership skills among students
4. To involving students to learn actively
5. To offer opportunities of interaction with peer students and staff.

THE OUTCOMES OF THE TECHNICAL SEMINAR ARE:

1. Good Communications Skills.
2. Knowing the Audience.
3. Choosing the Topic.
4. Setting the Goals for the Talk.
5. Talking to the Audience.
6. Knowing the Content of the Talk.
7. Preparation of the Slides.
8. Answering Questions.
9. Managing Time.

TOTAL: 30 hours

P15CSE515 NATURAL LANGUAGE PROCESSING AND INFORMATION RETRIEVAL

L T P C 3 0 0 3

COURSE OUTCOMES:

After successful completion of the course, the students would be able to

- Explain the various capabilities that information retrieval system must have.
- Identify suitable data structure for information storage and retrieval.
- Calculate similarity measures and apply ranking techniques for the information retrieved.
- Explain the role of language processing in information retrieval system.
- Evaluate the IR systems irrespective of the type of data.

UNIT- I **9**

Introduction to Information Retrieval Systems – Information Retrieval System Capabilities- Search Capabilities- Browse Capabilities- Miscellaneous Capabilities - Cataloging and Indexing - Indexing Process- Automatic Indexing - Classes of Automatic Indexing -Statistical Indexing -Natural Language -Concept Indexing -Hypertext Linkages - Information Extraction

UNIT- II **9**

Data Structure - Stemming Algorithms -Inverted File Structure -N-Gram Data Structures -PAT Data Structure - Signature File Structure -Hypertext and XML Data Structures -Hidden Markov Models

UNIT-III **9**

Document and Term Clustering - Thesaurus Generation - Item Clustering - Hierarchy of Clusters- User Search Techniques - Search Statements and Binding - Similarity Measures and Ranking - Selective Dissemination of Information Search - Weighted Searches of Boolean Systems - Searching the INTERNET and Hypertext

UNIT-IV **9**

Natural Language Processing – Linguistic Background- Spoken language input and output Technologies – Written language Input - Mathematical Methods - Statistical Modeling and Classification Finite State methods Grammar for Natural Language Processing – Parsing – Semantic and Logic Form – Ambiguity Resolution – Semantic Interpretation.

UNIT –V **9**

Multimedia Information Retrieval - Spoken Language Audio Retrieval - Non-Speech Audio Retrieval - Graph Retrieval - Imagery Retrieval - Video Retrieval - Information System Evaluation - Measures Used in System Evaluations - Measurement Example - TREC Results

Total: 45 hours

REFERENCE BOOKS:

1. Gerald J. Kowalski , Mark T. Maybury , " Information Storage And Retrieval Systems Theory and Implementation", Second Edition , Kluwer Academic Publishers.
2. Ricardo Baeza-Yates , Berthier Ribeiro- Neto "Modern Information Retrieval" Addison Wesley , ACM Press , 1(9)(9)(9).
3. Tomek Strzalkowski " Natural Language Information Retrieval ", Kluwer academic Publishers,1999
4. Daniel Jurafsky and James H. martin, " Speech and Language Processing" , 2008

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME III Semester under Regulations 2015
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15CSE301	Data Science and Big Data Analytics	3	0	0	3
2	P15CSE302	Internet of Things	3	0	0	3
3	P15CSE519	**Elective**- Data Warehousing and Datamining	3	0	0	3
4	P15CSE526	**Elective –** Cloud Computing	3	0	0	3
Practical						
5	P15CSE303	Project Phase -I	0	0	12	6
					Total Credits	**18**

Approved by

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

Member Secretary, Academic Council
Dr.R.Shivakumar

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

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

P15CSE301 DATA SCIENCE AND BIG DATA ANALYTICS 3 0 0 3

Course Outcomes:
At the end of the course, 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
- Design various applications by selecting appropriate data visualizations to clearly communicate analytic insights to business sponsors and analytic audiences
- Use R and RStudio, MapReduce/Hadoop tools to perform in-database analytics

UNIT I INTRODUCTION TO BIG DATA ANALYTICS 9
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 - Operationalzing

UNIT II REVIEW OF BASIC DATA ANALYTIC METHODS USING R 9
Using R to Look at Data – Introduction to R - Analyzing 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 hours

Reference Books:-

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

P15CSE302 INTERNET OF THINGS 3 0 0 3

COURSE OUTCOMES:
At the end of the course, students will be able to

- Identify and design the new models for market strategic interaction
- Design business intelligence and information security for WoB
- Analyze various protocols for IoT
- Design a middleware for IoT
- Analyze and design different models for network dynamics

UNIT I INTRODUCTION 10

Definitions and Functional Requirements –Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security

UNIT II IOT PROTOCOLS 8

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security

UNIT III WEB OF THINGS 10

Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture

UNIT IV INTEGRATED MODELS 9

Integrated Billing Solutions in the Internet of Things Business Models for the Internet of Things - Network Dynamics: Population Models – Information Cascades - Network Effects - Network Dynamics: Structural Models - Cascading Behavior in Networks - The Small-World Phenomenon

UNIT V APPLICATIONS 8

The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging

TOTAL: 45 hours

REFERENCES:

1. The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press – 2012

2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles-(Eds.) – Springer – 2011

3. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press - 2010

4. The Internet of Things: Applications to the Smart Grid and Building Automation by - Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley -2012

5. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012

P15CSE519 DATA WAREHOUSING AND DATA MINING 3 0 0 3

COURSE OUTCOMES

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

- Describe the role of statistics in data mining and identify the steps in mining
- Identify the role of data preprocessing for improved 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 ethical aspect of Data mining

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.

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 – Analytical Characterization – Analysis of Attribute Relevance.

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.

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

Applications of Data Mining and Trends in Data Mining - Social Impacts Of Data Mining-Tools-An Introduction To DBMiner-Case Studies-Mining WWW-Mining Text Database-Mining Spatial Databases.

Total: 45 hours

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.

P15CSE526 CLOUD COMPUTING 3 0 0 3

COURSE OUTCOMES

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

- Describe the principles of cloud computing like SaaS, PaaS and IaaS
- Design simple Grid distributed computing environments using lower level services
- Design simple applications/projects using various cloud computing tools like Eucalyptus, Open Nebula and CloudSim
- Implement the virtualization in distributed computing
- Implement security in cloud business models

UNIT I CLOUD ARCHITECTURE AND MODEL 9

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

UNIT II VIRTUALIZATION 9

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation

UNIT III CLOUD INFRASTRUCTURE 9

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

UNIT IV PROGRAMMING MODEL 9

Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

UNIT V CLOUD SECURITY 9

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application

Security – Virtual Machine Security – Identity Management and Access Control – Autonomic Security.

Total: 45 hours

REFERENCES:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From

Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation,Management, and Security", CRC Press, 2010.

3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 200(9).

4. Kumar Saurabh, " Cloud Computing – insights into New-Era Infrastructure", Wiley India,2011.

5. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly

6. James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 2005

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME IV Semester under Regulations 2015
Computer Science and Engineering
Branch: M.E. Computer Science and Engineering

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Practical						
1	P15CSE401	Project Phase – II	0	0	24	12
					Total Credits	**12**

Approved by

Chairperson, Computer Science and Engineering BOS
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Member Secretary, Academic Council
Dr.R.Shivakumar

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

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