SONA COLLEGE OF TECHNOLOGY, SALEM-5

(An Autonomous Institution)

M.Tech-Information Technology

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
Information Technology
Branch: M.Tech. Information Technology

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15MIT101	Theoretical Foundations of Computer Science	3	2	0	4
2	P15MIT102	Advanced Data Structures and Algorithms	3	0	0	3
3	P15MIT103	Advanced Computer Architecture	3	2	0	4
4	P15MIT104	Software Engineering Methodologies	3	0	0	3
5	P15MIT105	Network Engineering	3	0	2	4
6	P15MIT106	Distributed Systems	3	0	0	3
Practical						
7	P15MIT107	Data Structures Laboratory	0	0	4	2
					Total Credits	**23**

Approved by

Chairperson, Information Technology BoS
Dr.J.Akilandeswari

Member Secretary, Academic Council
Dr.R.Shivakumar

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

Copy to:-
HOD/IT, First Semester M.Tech IT Students and Staff, COE

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME II Semester under Regulations 2015
Information Technology
Branch: M.Tech. Information Technology

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15MIT201	Advanced Database Technology	3	0	0	3
2	P15MIT202	Web Technology	3	0	0	3
3	P15MIT203	Mobile and Pervasive Computing	3	0	0	3
4	P15MIT204	Applied Cryptography	3	2	0	4
5	P15MIT205	Cloud Computing	3	0	0	3
6	P15MIT519	**Elective -** Multimedia Technologies	3	0	0	3
Practical						
7	P15MIT206	Web Technology and Cloud Computing Laboratory	0	0	4	2
8	P15MIT207	Mini Project	0	0	4	2
					Total Credits	**23**

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Sona College of Technology, Salem
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Courses of Study for ME III Semester under Regulations 2015
Information Technology
Branch: M.Tech. Information Technology

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15MIT506	**Elective-** Information Security	3	0	0	3
2	P15MIT508	**Elective-** Big Data Analytics	3	0	0	3
	P15MIT516	Software Quality Assurance and Testing				
3	P15MIT522	**Elective-** Swarm Intelligence	3	0	0	3
Practical						
4	P15MIT301	Project Phase I	0	0	12	6
					Total Credits	**15**

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Sona College of Technology, Salem
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Courses of Study for ME IV Semester under Regulations 2015
Information Technology
Branch: M.Tech. Information Technology

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Practical						
1	P15MIT401	Project Phase – II	0	0	24	12
					Total Credits	**12**

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HOD/IT, Fourth Semester M.Tech IT Students and Staff, COE

Sona College of Technology, Salem
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Courses of Study for ME I Semester under Regulations 2015
Information Technology
Branch: M.Tech. Information Technology

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15MIT101	Theoretical Foundations of Computer Science	3	2	0	4
2	P15MIT102	Advanced Data Structures and Algorithms	3	0	0	3
3	P15MIT103	Advanced Computer Architecture	3	2	0	4
4	P15MIT104	Software Engineering Methodologies	3	0	0	3
5	P15MIT105	Network Engineering	3	0	2	4
6	P15MIT106	Distributed Systems	3	0	0	3
Practical						
7	P15MIT107	Data Structures Laboratory	0	0	4	2
					Total Credits	**23**

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P15MIT101 THEORETICAL FOUNDATIONS OF COMPUTER SCIENCE 3 2 0 4

COURSE OUTCOMES

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

1. Explain the concepts of set theory, relations, function, types of functions and apply the concepts to solve problem
2. Define and explain symbolic logic, construct truth tables and discuss the validity of the arguments
3. Apply predicates and solve the complicated logical problems
4. Compute theoretical models using automata theory and to identify formal languages
5. Explain the concepts of different terminologies in graph theory and apply them to solve problems in describing relations among modules

UNIT – I FUNDAMENTAL STRUCTURES 9

Set theory - Relationships between sets – Operations on sets – Set identities - Principle of inclusion and exclusion – Minsets. Relations:– Binary relations – Partial orderings – Equivalence relations. Functions:– Properties of functions – Composition of functions – Inverse functions – Permutation functions

UNIT - II LOGIC 9

Propositional logic – Logical connectives – Truth tables – Normal forms (conjunctive and disjunctive) – Predicate logic – Universal and existential quantifiers – Proof techniques – direct and indirect – Proof by contradiction

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 COMPUTATION AND LANGUAGES 9

Finite state machines – Deterministic and Non- deterministic finite state machines – Turing Machines – Formal Languages – Classes of Grammars – Type 0 – Context Sensitive – Context Free – Regular Grammars – Ambiguity

UNIT – V GRAPHS 9

Introduction to Graphs-Graph terminology-Representation of Graphs-Graph Isomorphism-Connectivity-Euler and Hamilton Paths-Connectedness in Directed Graphs-Shortest Path Algorithms-Spanning Trees-Minimum Spanning Tree-Rooted and Binary Trees

Tutorial: 30 hours

Total: 75 hours

REFERENCES

1. Judith L.Gersting, "Mathematical Structures for Computer Science", W.H. Freeman and Company, NY, 2006.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Fifth Edition, TMH, 2003.
3. M.K. Venkataraman, N. Sridharan and N.Chandrasekaran," Discrete Maths.", The National Publishing Company, 2003.
4. Ralph, P. Grimaldi, "Discrete and Combinatorial Mathematics", Pearson Education 2006.
5. T.Veerarajan, "Discrete Mathematics", Tata McGraw Hill Education Private Limited, New Delhi, 13th Reprint 2011.

P15MIT102 ADVANCED DATA STRUCTURES AND ALGORITHMS 3 0 0 3

COURSE OUTCOMES

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

1. Explain the role of algorithms in real world problems and represent algorithmic time complexity using asymptotic notations
2. Explain and the apply the operations of hierarchical data structures such as BST, red-black trees, B-trees and heap
3. Explain and implement the graph algorithms
4. Explain the algorithmic design methodologies like dynamic programming and greedy approach
5. Characterize the problems as NP complete, NP hard and NP

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 –Divide and Conquer- Maximum-subarray problem- Strassen's algorithm- Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method-The Master 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 B trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Fibonacci Heaps: Structure – 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 Floyd-Warshall 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 COMPLETENESS AND APPROXIMATION ALGORITHMS 9

NP-Completeness: Polynomial Time – Polynomial-Time Verification – NP-Completeness and Reducability – NP-Completeness Proofs – NP-Complete Problems- Approximation Algorithms: Vertex-Cover problem- Travelling-Salesman problem – Subset-sum problem

Total : 45 hours

REFERENCES

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", Third Edition, Prentice-Hall 2009.
2. Robert Sedgewick and Kevin Wayne, "Algorithms", Fourth Edition, Pearson Education.
3. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
4. Donald E Knuth, "Art of Computer Programming-Volume I- Fundamental Algorithms", Third edition, Addison Wesley, 2008.

P15MIT103 ADVANCED COMPUTER ARCHITECTURE 3 2 0 4

COURSE OUTCOMES

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

1. Explain the concept of parallelism and overcoming data hazards with dynamic scheduling
2. Apply the different compiler techniques to implement the instructions level parallelism and compare hardware versus software speculation concepts
3. Explain symmetric and distributed shared memory architectures and models of memory consistency
4. Analyze the different Multi-core architecture and measure the different multi-core architecture performance
5. Explain the concept of memory hierarchies, virtual memory and virtual machines

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.

Tutorial: 30 hours

Total: 75 hours

REFERNCES

1. John L. Hennessey and David A. Patterson, " Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier, 4th. edition, 2007.
2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Pearson Education, Seventh Edition, 2006.
3. D. Sima, T. Fountain and P. Kacsuk, "Advanced Computer Architectures: A Design Space Approach", Addison Wesley, 2000.
4. Kai Hwang "Advanced Computer Architecture: Parallelism, Scalability, Programmability" Tata McGraw Hill Edition, 2001.
5. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw Hill, 2002.

P15MIT104 SOFTWARE ENGINEERING METHODOLOGIES 3 0 0 3

COURSE OUTCOMES

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

1. Apply a suitable SDLC model for the software to be developed based on the scope and requirements of software engineering in IT industry
2. Explain the object-oriented methodologies and workflows and apply object-oriented principles, techniques, appropriate UML models, and other artifacts to construct a design for a real-world problem
3. Analyze system requirements to determine the use cases and domain model of the problem domain and describe the classification techniques of objects
4. Apply different software testing methodologies to make defect free software
5. Apply reengineering process to do alteration in the developed software

UNIT I THE PROCESS 9

Software Engineering the nature of Software -Software Process Models: Waterfall Model-Incremental process models-Evolutionary process models: Prototyping-Spiral model – Concurrent model- Comparison study of Software Process Models -Introduction to Agile process

UNIT II REQUIREMENTS ANALYSIS 9

Requirements Engineering- tasks – Initialization the Requirement Engineering process - Eliciting requirements-Building the requirements model-Validating Requirements - Requirements analysis-Model Approaches – Data Modeling Concepts-Class Based Modeling - Behavioral Model

UNIT III DESIGN CONCEPTS AND PRINCIPLES 9

The Design concepts - The Design model-Architectural design-Designing Class Based Components -User interface design: user analysis and design, Interface analysis, Interface design steps- Software risk management,

UNIT IV TESTING TECHNIQUES AND MANAGEMENT 9

Software testing – Path testing – Control structures testing – Black Box testing – Unit, Integration, Validation and system testing – SCM

UNIT V TRENDS IN SOFTWARE ENGINEERING 9

Software Re-engineering– Metrics for Process and Projects- Case Study of CASE tools.

Total : 45 hours

REFERENCES

1. Roger S Pressman," Software Engineering – A Practitioner's Approach", McGraw Hill, USA, 2010.
2. Ian Sommerville, Software Engineering, Addison-Wesley, Ninth Edition, 2010.
3. Gopalswamy Ramesh and Srinivasan Desikan, "Software Testing: Principles and Practices", Pearson Education, New Delhi, 2006.
4. Fairley, Software Engineering Concepts, McGraw-Hill, 2009.

P15MIT105 NETWORK ENGINEERING 3 0 2 4

COURSE OUTCOMES

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

1. Describe various types of protocol architecture and apply IPv4 address classes for subnetting
2. Select and apply appropriate protocols for high speed networks
3. Apply various congestion control and link control mechanisms for traffic management
4. Apply various queuing disciplines to achieve QoS
5. Describe various Protocols for QoS support

UNIT I PROTOCOLS AND TCP/IP SUITE 9

Need for Protocol Architecture-TCP/IP Protocol Architecture-OSI Model-Internetworking- Transmission control Protocol-User Datagram Protocol -Internet Protocol-IPv4 header and addresses-Subnetting-IPv6 header and Addresses

UNIT II HIGH SPEED NETWORKS 9

Packet Switched Networks-Basic operation-Virtual Circuit approach-X.25- Frame relay networks- Architecture - Asynchronous Transfer Mode(ATM)- Protocol architecture- Logical Connections - Cells-Service categories- AAL protocol and Services- Emergence of High speed LAN-Ethernet-Fibre channel -Wireless LAN- requirements- IEEE 802.11Architeure and Protocol layers .

UNIT III CONGESTION AND TRAFFIC MANAGEMENT 9

Effects of Congestion- Congestion control – Traffic management-Congestion control in Packet Switched Networks-Frame relay Congestion control-Need for flow control and Error control-Link Control mechanisms - Stop and Wait-Sliding Window Techniques- Goback- N ARQ - TCP Flow control-TCP implementation Policies –TCP Flow and Congestion Control- TCP Window Management.

UNIT IV QUALITY OF SERVICE IN IP NETWORKS 9

Integrated Service Architecture-Elastic Traffic and Inelastic Traffic- ISA approach – ISA Components and Services - Queuing Disciplines- Fair Queuing –Processor Sharing –Bit Round Fair Queuing Generalized Processor Sharing – Weighted Fair Queuing -Random Early Detection –Differentiated Services- Configuration and Operation – Per-Hop Behavior.

UNIT V PROTOCOLS FOR QoS SUPPORT 9

Resource Reservation-RSVP- Goals and Characteristics –Operation-Protocol mechanisms- Multiprotocol Label Switching –MPLS Operation- Real time Protocol(RTP)- Protocol architecture-RTP header- RTP control Protocol (RTCP)-Functions and Formats.

Practical: 30 hours
Total: 75 hours

REFERENCES

1. William Stallings, 'High Speed Networks and Internets -Performance and Quality of Service',2nd Edition, Pearson Education, 2008.
2. Behrouz A.Forouzon 'TCP/IP Protocol Suite',4th Edition, Mc Graw Hill Education,2010.
3. Larry L Peterson and Bruce S Davie, 'Computer Networks: A Systems Approach', Fourth Edition, Morgan Kaufman Publishers, 2011.
4. Jean Warland and Pravin Vareya, 'High Performance Networks',Morgan Kauffman Publishers, 2009
5. Mahbub Hassan and Raj Jain, 'High Performance TCP/IP Networking', Pearson Education, 2005.

Lab Exercises:

1. Installation and study of Network Simulator ns-2 commands.
2. Simulation of four node wired network and data transfer with TCP agent using ns-2
3. Simulation of dumbbell topology and data transfer with TCP agent using ns-2
4. Simulation of Ethernet LAN using n-nodes
5. Creation of congestion in wired network using ns-2
6. Implementation of Link state Routing Protocol using ns-2
7. Implementation of Distance Vector Routing Protocol using ns-2
8. Generation of X graph for Packet Delivery Ratio, Throughput and Delay
9. Creation of DDOS attack in ns-2
10. Creation of network topology using packet tracer.

P15MIT106 DISTRIBUTED SYSTEMS 3 0 0 3

COURSE OUTCOMES

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

1. Explain the distributed systems concepts and deployment of large scale distributed systems
2. Explain in detail about network visualization and remote invocations required for distributed system
3. Evaluate the distributed algorithms for locking, synchronization and concurrency, scheduling and replication
4. Identify the security challenges faced by distributed system programs
5. Describe the appropriate solutions to meet the needs of commonly encountered distributed programming scenarios

UNIT I INTRODUCTION AND PROCESSES 9

Definition – Goals – Types of Distributed Systems – Architectures – Architectural Styles – Architectures Vs Middleware – Self Management in Distributed Systems – Processes – Threads – Virtualization – Clients – Servers – Code Migration.

UNIT II COMMUNICATION AND NAMING 9

Fundamentals – Remote Procedure Call – Message-Oriented Communication – Stream-Oriented Communication – Multicast Communication – Naming – Names, Identifies and Addresses – Flat Naming – Structured Naming – Attribute-based Naming.

UNIT III SYNCHRONIZATION AND CONSISTENCY AND REPLICATION 9

Clock Synchronization – Logical clocks – Mutual Exclusion – Global Positioning of Nodes – Election Algorithms – Consistency and Replication – Introduction – Data Centric – Client Centric Consistency Model s- Replica Management – Consistency Protocols.

UNIT IV FAULT TOLERANCE AND SECURITY 9

Introduction – Process Resilience - Reliable Client-Server Communication - Reliable Group Communication - Distributed Commit – Recovery – Security - Introduction to Security - Secure Channels - Access Control - Security Management.

UNIT V CASE STUDIES 9

Distributed File Systems - Distributed Web-Based Systems

Total : 45 hours

REFERENCES:

1. Andrew S. Tanenbaum, Maarten and Van Steen, " Distributed Systems: Principles and Paradigms", Pearson Prentice Hall, 2007.
2. Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating Systems", McGraw- Hill, 2008.
3. Abraham Silberschatz, Peter B. Galvin, G. Gagne, "Operating System Concepts", Sixth Edition, Addison Wesley Publishing Co., 2012.
4. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Addison Wesley, 2011.
5. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, "Distributed Systems: Concepts and Design Addison-Wesley, 5th edition, 2011.

P15MIT107 **DATA STRUCTURES LABORATORY** **0 0 4 2**

COURSE OUTCOMES

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

1. Implement the tree data structure
2. Implement graph algorithms
3. Implement problems in greedy and approximation approach

Experiments

1. Implementation of Binary Search Tree
2. Implementation of Fibonacci Heaps
3. Implementation of Red-Black tree
4. Implementation of Spanning Tree
5. Implementation of Shortest Path Algorithms
6. Implementation of Graph Traversals
7. Implementation of Greedy Algorithms
8. Implementation of Approximation Algorithms

Total: 60 hours

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Theory						
1	P15MIT201	Advanced Database Technology	3	0	0	3
2	P15MIT202	Web Technology	3	0	0	3
3	P15MIT203	Mobile and Pervasive Computing	3	0	0	3
4	P15MIT204	Applied Cryptography	3	2	0	4
5	P15MIT205	Cloud Computing	3	0	0	3
6	P15MIT519	**Elective -** Multimedia Technologies	3	0	0	3
Practical						
7	P15MIT206	Web Technology and Cloud Computing Laboratory	0	0	4	2
8	P15MIT207	Mini Project	0	0	4	2
					Total Credits	**23**

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P15MIT201 ADVANCED DATABASE TECHNOLOGY 3 0 0 3

COURSE OUTCOMES

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

1. Design ER model and implement constraints and triggers to maintain database consistency,
2. Apply functional dependencies and normalize relational data model and explain data storage indexing techniques for data organization.
3. Explain the need for transaction management in databases.
4. Design databases in NoSQL data base management systems,
5. Explain the database concepts applied in next generation databases.

UNIT I ER DATA MODELING AND RELATIONAL MODEL 9

Data Modeling using ER Model – Enhanced ER model – Relational Model and Constraints – ER and EER mapping to relational model - Relational Algebra – SQL – Basic Statements, Complex Queries, Data Modification Statements – Constraints and Triggers – Views.

UNIT II DATABASE DESIGN 9

Functional Dependencies and Normalization – Function Dependencies – Normal Forms – Relational Decompositions – Multivalued Dependencies And Fourth Normal Form – Join Dependencies And Fifth Normal Form – Physical Design – Basic File Structures and Hashing – Placing File Records on Disk – Operations on Files – Heap Files – Sorted Files – Hashing Techniques – Indexing Structures for Files – Single Level, Multilevel Indexes, Dynamic Multilevel Indexes Using B-Trees and B+ Trees – Indexes on Multiple Keys – Database Tuning.

UNIT III TRANSACTION MANAGEMENT, CONCURRENCY CONTROL and RECOVERY 9

Introduction to Transaction Processing – Concepts – Properties – Recoverability – Serializability – Transaction Support in SQL – Concurrency Control – Two Phase Locking – Timestamp Ordering – Multiversion and Validation Concurrency Control Techniques - Recovery Concepts – Deferred Update – Immediate Update – Shadow Paging – Aries.

UNIT IV WEB DATABASES 9

NoSQL Databases - MongoDB example - Semi-structured data management - XML, XPath and XQuery, Document data-stores -Examples, Key-Value data-stores - Examples- In-memory databases-VoltDB example - Embedded Databases - definition- Example - SQLite internal architecture and data types.

UNIT V NEXT GENERATION DATABASES 9

Cloud Databases- methods to run- virtual machine deployment, as a service- Column Stores-Examples-Cassandra, HBase-Aggregation and Join, - Case study- BigTable Google's distributed storage system for structured data-building blocks-GFS, Scheduler, Lock Service, MapReduce

Graph databases- Comparison of Twitter's FlockDB and Neo4j- Overview of NewSQL- Case study -Google's Spanner

Total: 45 hours

REFERENCES:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw Hill, Third Edition 2004.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Fifth Edition, McGraw Hill, 2006.
4. Serge Abiteboul, Ioana Manolescu, Philippe Rigaux, Marie -Christine Rousset, Pierre Senellart, Web Data Management, Cambridge University Press, 450 pages,2011.
5. Bhavani Thuraisingham, XML Databases and the Semantic Web, CRC Press, 2002.
6. SQLite, FromWikipedia,the free encyclopedia, http://en.wikipedia.org/wiki/SQLite
7. Dale Anderson, Big Data and NoSQL Technologies at http://dbbest.com/blog/big-data- nosql-technologies/
8. Big Table and Column Databases,Ling Liu,College of Computing: http://www.cc.gatech.edu/~lingliu/courses/cs4440/notes/17.BigTableColumnDB.pdf
9. Klint Finley, 5 Graph Databases to Consider at http://readwrite.com/2011/04/20/5-graph- databases-to-consider
10. Graph databases- Ian Robinson, Jim Webber, Emil Eifrem, O'Reilly
11. Vijay Kumar, "Mobile Database Systems", A John Wiley & Sons, Inc., Publication.
12. Dale Anderson, Column Oriented Database Technologies at http://dbbest.com/blog/column-oriented-database-technologies/

P15MIT202 WEB TECHNOLOGY 3 0 0 3

COURSE OUTCOMES

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

1. Design a web page using HTML5 and CSS3.
2. Write a server side program for generating dynamic web page using Servlets and JSP
3. Construct a web service and AJAX based web application
4. Develop a web application using PHP
5. Create a web application using Ruby on Rails framework

UNIT I HTML and DHTML 9

HTML - HTML Forms- Cascading Style Sheets- Scripting Languages: Javascript -DHTML: Object models and collections - Event Model-Filters and transitions – Data binding with tabular data control – HTML5 – CSS3.

UNIT II SERVLETS AND JSP 9

Servelet life cycle – Servelet API – Simple Servelet – Cookies – Session Tracking – Database Connectivity - Servelet Chaining. Java Server Pages – Components of JSP – JSP Sessions – Using Cookies – Disabling Sessions.

UNIT III AJAX AND WEB SERVICES 9

AJAX –- Web Services – WSDL -UDDI – SOAP – Deploying and Managing Web Services.

UNIT IV WEB APPLICATIONS USING PHP & MYSQL 9

Programming with PHP – Introduction, syntax, variables, strings, operators, if – else, loop, switch, array, function, form, email, file upload, session, error, exception filter, php – ODBC. MySQL: Setting up account – Writing your own SQL programs – MySQL and Web.

UNIT V RUBY ON RAILS 9

Framework - Installation and Directory Structure - Creating Rails Applications – Migrations- Controllers – Routes – Views – Layouts- Scaffolding – File Uploading – Sending Mails.

Total : 45 hours

REFERENCES

1. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, "Internet & World Wide Web How to Program", 5th edition, Pearson, 2012.
2. N.P. Gopalan, Akilandeswari,J, "Web Technology: A Developer's Prespective", 2nd Edition, PHI Learning, 2014.
3. Michael Hartl, Ruby on Rails Tutorial: Learn Web Development with Rails, Addison-Wesley Professional Ruby, 2015
4. Heather Williamson, "The Complete Reference XML", TMH, 2001.
5. Anura Guruge, "Web Services Theory and Practices", ELSEVIER Digital Press.
6. Steven Holzner, "PHP Complete Reference", TMH, 2nd Edition, Indian Print 2009

P15MIT203 MOBILE AND PERVASIVE COMPUTING 3 0 0 3

COURSE OUTCOMES

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

1. Comprehend the need of different types of computing and performance issues
2. Design and implement location aware computing.
3. Design algorithms for location estimation based on different techniques and platforms.
4. Explain of Local Area and Wide Area Technologies.
5. Analyze, implement and maintain security requirements and mechanisms in mobile computing

UNIT I PERVASIVE ARCHITECTURE 9

Pervasive Architecture: Local Area Networks – Wireless LANs – Relationship of Wireless, Internet and Ubiquitous Computing– Pervasive Computing and Ubiquitous Computing – Ambient Computing – Pervasive Web application Architecture – Requirements of computational infrastructure – failure management – security – performance – dependability

UNIT II MOBILE DEVICE TECHNOLOGIES 9

Mobile Device Technologies Mobile Computing devices characteristics – Adaptation – Data dissemination and Management –Heterogeneity – Interoperability – Context awareness – Language localization issues – User Interface design issues

UNIT III SENSOR NETWORKS AND RFID'S 9

Introduction: Introduction to Sensor networks – Sensor Node Architecture – Sensor Network Architecture – Types of sensor networks – Platforms for Wireless sensor networks – Applications of Wireless Sensor networks

Introduction: Introduction to RFID – transponder and reader architecture – Types of tags and readers – Frequencies of operation – Application of RFID Technologies.

UNIT IV LOCAL AREA AND WIDE AREA WIRELESS TECHNOLOGIES 9

Local Area and Wide Area Technology: IEEE 802.11 technologies – Bluetooth networks (OBEX Protocol) – Personal Area Networks- Cellular Wireless Networks – GSM – Architecture – Protocols – Connection Establishment – Routing – Mobility Management - GPRS.

UNIT V PRIVACY AND SECURITY IN PERVASIVE COMPUTING 9

Security Technologies: Public Key Infrastructure (PKI) – terms of PKI – Simple Public Key Infrastructure (SPKI) – terms of SPKI

Public key Infrastructure: Password based public key infrastructure – Prior context– Diffie – Hellman method.

Total: 45 Hours

REFERNCES

1. Adelstein.F, Gupta S.K.S., "Fundamentals of Mobile and Pervasive Computing" Tata McGraw-Hill, 2005
2. Burkhardt, Henn, Hepper, Rintdorff, Schaeck, "Pervasive Computing", Addison Wesley, 2002.
3. Ashoke Talukdar and Roopa Yavagal, "Mobile Computing", Tata McGraw Hill, 2005
4. Scott, Charlie,"Virtual privacy networks", O'Reilly publication, 2000.
5. Swaminathan. Tara and Elden, Charles, "Wireless security and privacy", Pearson education Asia publication, 2003.
6. William Stallings, "Cryptography and networks security", 3rd edition, Pearson education publication, 2005.

P15MIT204 APPLIED CRYPTOGRAPHY 3 2 0 4

COURSE OUTCOMES

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

1. Explain the basic principles and properties of modern encryption
2. Apply operations of private key cryptography and message authentication codes.
3. Implement block ciphers.
4. Apply and analyze public key cryptographic algorithms
5. Design digital signatures by applying digital signature standards and schemes.

UNIT – I INTRODUCTION 9

Cryptography and Modern Cryptography – The Setting of Private-Key Encryption – Historical Ciphers and their Cryptanalysis – The Basic principles of Modern Cryptography – Principle 1, 2, & 3. Perfectly-Secret Encryption: Definitions and Basic Properties – The One-Time Pad (Vernam's Cipher) – Limitations of Perfect Secrecy – Shannon's Theorem.

UNIT – II PRIVATE KEY CRYPTOGRAPHY 9

Private-Key Encryption and Pseudo randomness: A Computational Approach to Cryptography – Defining Computationally-Secure Encryption – Pseudo randomness – Constructing Secure Encryption Schemes. Message Authentication Codes and Collision-Resistant Hash Functions: Secure Communication and Message Integrity – Encryption vs. Message Authentication – Message Authentication Codes – Definitions – Constructing Secure Message Authentication Codes – CBC MAC – Collision-Resistant Hash Functions .

UNIT – III BLOCK CIPHERS 9

Substitution-Permutation Networks – Feistel Networks – DES-The Data Encryption Standard – Increasing the Key Length of a Block Cipher – AES-The Advanced Encryption Standard – Differential and Linear Cryptanalysis – One-way functions.

UNIT IV PUBLIC KEY CRYPTOGRAPHY 9

Preliminaries and Basic Group Theory – Primes, Factoring and RSA – Assumptions in Cyclic Groups – Cryptographic Applications of Number-Theoretic Assumptions. Factoring and Computing Discrete Logarithms: Algorithms for Factoring – Algorithms for Computing Discrete Logarithms. Private-Key Management and the Public-Key Revolution – Public-Key Encryption.

UNIT V DIGITAL SIGNATURE SCHEMES 9

An Overview – Definitions – RSA Signatures – The "Hash-and-Sign" Paradigm – Lamport's One-Time Signature Scheme – Signatures from Collision-Resistant Hashing – The Digital Signature Standard (DSS) – Certificates and Public-Key Infrastructures.

Total: 75 Hours

REFERENCES

1. Jonathan Katz and Yehuda Lindell, "Introduction to Modern Cryptography", CRC Press, 2007.
2. Alfred J. Menezes, Paul C. van Oorschot, Scott A. Vanstone, "Handbook of Applied Cryptography", CRC Press, 1997.
3. Bruce Schneier, "Applied cryptography: protocols, algorithms, and source code in C", John Wiley & Sons, 2007.
4. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education, Limited, 2013.

P15MIT205 CLOUD COMPUTING 3 0 0 3

COURSE OUTCOMES

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

1. Explain the need and challenges of cloud computing
2. Explain the technologies and services associated with cloud computing
3. Apply the types of abstraction and virtualization management in the cloud
4. Apply the concepts for managing and securing in the cloud
5. Analyze the different framework and describe some of the tools available for creating cloud.

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

Introduction to Cloud Computing: Overview, Roots of Cloud Computing, Layers and Types of Cloud, Desired Features of a Cloud, Benefits and Disadvantages of Cloud Computing, Challenges and Risks, Assessing the role of Open Standards

UNIT II CLOUD ARCHITECTURE, SERVICES AND APPLICATIONS 9

Exploring the Cloud Computing Stack, Connecting to the Cloud, Infrastructure as a Service, Platform as a Service, Using PaaS Application Frameworks, Software as a Service, Saas vs. Paas, Identity as a Service, Compliance as a Service

UNIT III ABSTRACTION AND VIRTUALIZATION 9

Introduction to SAN, Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hyper visors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action

UNIT IV MANAGING & SECURING THE CLOUD 9

Administrating the Clouds, Cloud Management Products, Emerging Cloud Management Standards, Securing the Cloud, Securing Data, Establishing Identity and Presence

UNIT V CASE STUDIES 9

Using Hadoop Framework, Using owncloud Framework, Using Google Web Services, Using Amazon Web Services

Total: 45 hours

REFERENCES

1. Sosinsky B., "Cloud Computing Bible", Wiley India Pvt Ltd, 2011.
2. Buyya R., Broberg J., Goscinski A.,"Cloud Computing : Principles and Paradigm", Wiley, 2013.
3. Velte T., Velte A., Elsenpeter R., "Cloud Computing – A practical Approach", Tata Mcgraw Hill Education Private Limited, 2009.
4. Linthicium D., "Cloud Computing and SOA Convergence in Enterprise", Pearson Education, 2009.
5. Shroff G., "Enterprise Cloud Computing", Cambridge University Press, 2010.
6. Smooth S., Tan N., "Private Cloud Computing", 1st Edition, Morgan Kauffman, 2011.
7. Miller Michael, "Cloud Computing: Web Based Applications that Change the Way You Work and Collaborate On line", Pearson Education India, 2008.

P15MIT206 WEB TECHNOLOGY AND CLOUD COMPUTING LABORATORY

0 0 4 2

COURSE OUTCOMES

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

1. Apply the concepts of web designing and various web technologies to write client side and server side programs.
2. Implement the map reduce algorithm using Hadoop framework to create cluster nodes.
3. Implement a cloud application using Google API and IBM Bluemix which offers PaaS.

LIST OF EXPERIMENTS

4. Demonstrate the use of CSS3 and HTML5 in the design of a web page.
5. Write a Javascript to validate and create interactive web pages by handling different types of page events.
6. Develop a web application of following type using Java Servlets and JSP
    a. Multi tier application
    b. Session Tracking
7. Write a web application to demonstrate the use of AJAX concept.
8. Write a client program to interact with the created web service.
9. Develop a web application of following type using PHP and MySQL
    a. Multi tier application c. Uploading a File
    b. Session Tracking d. Sending a E-Mail
10. Write a web application using Ruby on Rails and MySQL.
11. Study and install Apache Hadoop framework.
12. Configure a single and multi node cluster using Hadoop framework and write a map reduce application.
13. Write an application using Google drive API to store and retrieve files in Google cloud.
14. Build and deploy simple IoT application on IBM Bluemix.
15. Analyzing social media and structured data with InfoSpehere Big Insights.

P15MIT519 MULTIMEDIA TECHNOLOGIES 3 0 0 3

COURSE OUTCOMES

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

1. Explain the relevance and underlying infrastructure of the multimedia systems.
2. Comprehend core multimedia technologies and standards (Digital Audio, Graphics, Video, Text, and Animation, Authoring tools).
3. Apply the concepts of Multimedia Networks and Multimedia Retrieval.
4. Apply the concepts of Multimedia involved in Web.
5. Explain the concepts of Multimedia involved in Design (Text, image, sound, animation).

UNIT I MULTIMEDIA ELEMENTS 9

Introduction – Definitions – Applications – Elements - Text – Image/Graphics Audio – video Animation.

UNIT II MULTIMEDIA TOOLS 12

Macintosh and windows production platforms - 3-d modeling and animation – image editing tools - sound editing tools - animation - video - and digital movie tools - linking multimedia objects - office suites - word processors - spread sheets - databases - presentation tools. Authoring tools - Card and Page-based authoring tools - Icon Based authoring tools - time based authoring tools - object oriented authoring tools - cross platform-authoring tools

UNIT III MULTIMEDIA STORAGE AND MANAGEMENT 9

Storage and Retrieval and presentation-Synchronization Issues - Multimedia Operating Systems and Multimedia databases – Hypertext - Hypermedia Architectures.

UNIT IV MULTIMEDIA AND INTERNET 9

Internet fundamentals: Internetworking - Connections - Internet services - The World Wide Web - Tools for the World Wide Web: Web serves - Web browsers - Web page makers and Site builders - Plug-ins and Delivery vehicles - Beyond HTML

UNIT V DESIGINING FOR WORLD WIDE WEB 6

Working on web - Text for web - Images for web - Sound for web - Animation for web.

Total : 45 hours

REFERENCES:

1. Tay Vaughan, "Multimedia: Making It Work", Seventh Edition, Tata Mc- Graw hill, New Delhi, 2006
2. Ralf Steinmetz and Klara, "Multimedia Computing, Communications and Applications", Pearson Education, 2004.
3. K.Andleigh, Kiran Thakrar, Multimedia Systems Design, PHI, 2007.
4. Donald Hearn and M.Pauline Baker, "Computer Graphics C Version", Pearson Education, New Delhi, 2003.
5. Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", PHI Learning, New Delhi, 2003.
6. Ze Nian Li, S. Drew, "Fundamentals of Multimedia", PHI, 2006.
7. Fred Halsall, "Multimedia Communications- Applications, Networks, Protocols and Standards, Pearson Education, 2007.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME III Semester under Regulations 2015
Information Technology
Branch: M.Tech. Information Technology

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Theory						
1	P15MIT506	**Elective-** Information Security	3	0	0	3
2	P15MIT508	**Elective-** Big Data Analytics	3	0	0	3
	P15MIT516	Software Quality Assurance and Testing				
3	P15MIT522	**Elective-** Swarm Intelligence	3	0	0	3
Practical						
4	P15MIT301	Project Phase I	0	0	12	6
					Total Credits	**15**

Approved by

Chairperson, Information Technology BoS
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Member Secretary, Academic Council
Dr.R.Shivakumar

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

Copy to:-
HOD/IT, Third Semester M.Tech IT Students and Staff, COE

P15MIT506 INFORMATION SECURITY 3 0 0 3

COURSE OUTCOMES

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

1. Explain the essential fundamentals of information security
2. Explain and apply the Laws and code of Ethics in Information Security,
3. Evaluate vulnerability of an information system and establish a plan for risk management.
4. Describe the access control mechanism used for user authentication and authorization.
5. Maintain security infrastructure

UNIT I INTRODUCTION 9

An overview of Information Security, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.

UNIT II SECURITY INVESTIGATION 9

Need for Security:- Business Needs, Threats, and Attacks. Legal, Ethical and Professional Issues:- Law and Ethics in Information Security, International Laws and Legal Bodies, Ethics and Information Security.

UNIT III RISK MANAGEMENT AND SECURITY POLICY AND STANDARDS 9

Risk Management: Risk Identification, Risk Assessment, and Risk Control Strategies. Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model.

UNIT IV SECURITY TECHNOLOGY 9

Access Control, Firewalls, Protecting Remote Connections, Intrusion Detection and Prevention Systems, Scanning and Analysis Tools.

UNIT V IMPLEMENTING INFORMATION SECURITY AND SECURITY MAINTENANCE 9

Information Security Project Management, Technical and non technical Aspects of Implementation, Security Management Maintenance Models, Digital Forensics.

Total: 45 hours

REFERENCES

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003.
2. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3, CRC Press LLC, 2004.
3. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw-Hill, 2003.
4. Matt Bishop, "Computer Security Art and Science", Pearson/PHI, 2002.
5. Charles P.Pfleeger, Shari Lawrence Pfleeger, "Security in computing", 4th Edition, Pearson Publication, 2012.

P15MIT508 BIG DATA AND ANALYTICS 3 0 0 3

COURSE OUTCOMES

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

1. Explain the need and challenges of Big data and analytics
2. Apply and write jobs in Hadoop and map reduce framework
3. Configure Hadoop eco systems and work with tools that are handling big data.
4. Perform statistical based analysis and describe the data using various graphical methods.
5. Describe the various business domains require big data analytics and explain contribution of crowd with big data analytics.

UNIT – I INTRODUCTION 9

What is Big Data – Characteristics, Volume, Velocity, Variety, Data in the Warehouse and Data in the Hadoop – Why is Big data important – When to consider a big data solution, Big data use cases, IT Log analytics, fraud detection pattern, The social media pattern, Big data and energy sector.

UNIT – II HADOOP 9

History, Components of Hadoop, The Hadoop Distributed File system, The basics of MapReduce, Hadoop common components.

UNIT – III APPLICATION DEVELOPMENT IN HADOOP 9

Pig and Piglatin, Hive, JSQL, Getting the data into Hadoop, Basic copy data, Other Hadoop components, Zookeeper, Hbase, Lucene.

UNIT - IV DATA ANALYSIS PROCESS 9

The nature and role of variability – Statistics and data analysis process, Types of data and graphical displays, Graphical methods for describing data – Numerical methods for describing data – Summarizing Bi-variate data.

UNIT – V APPLICATIONS AND TRENDS 9

Digital Marketing, Fraud and Big Data, Risk and Big Data, Big data and Advances in Healthcare, Advertising and Big Data, Crowd Sourcing Analytics, latest trends.

Total : 45 hours

REFERENCES

1. Paul Zikopoulos, Chris Eaton, "Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data", McGraw Hill Professional, 2011.
2. Roxy Peck, Jay L. Devore, "Statistics: The Exploration & Analysis of Data", Brooks / Cole; 7 edition, 2011.
3. Michael Minelli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends", John Wiley & Sons, 27-Dec-2012.

P15MIT516 SOFTWARE QUALITY ASSURANCE AND TESTING 3 0 0 3

COURSE OUTCOMES

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

1. Explain the principles of software quality assurance and software process models.
2. Explain and apply different quality assurance standards.
3. Apply different software metrics to different software application scenarios.
4. Explain the Software Testing Principles and various concepts in managing defects.
5. Explain test management and automation tools available for software development

UNIT – I SOFTWARE QUALITY ASSURANCE 9

Software quality in business context – Managing Software Quality in an Organization - Planning for software quality assurance – Product quality and process quality – Software process models.

UNIT – II QUALITY ASSURANCE STANDARDS 9

ISO 9001– Capability Maturity Model – CMMi – People CMM – Test Maturity Model - six sigma – SPICE - Malcolm Baldrige Award

UNIT – III SOFTWARE QUALITY METRICS 9

Software Measurement and Metrics – Measurement Theory – Software quality metrics – Product quality metrics – Software maintenance metrics – Collecting software engineering data.

UNIT – IV TESTING FUNDAMENTALS 9

Principles of testing - Software development life cycle models-Types of testing- White box testing- Black box testing- Integration Testing –System and acceptance testing- Performance testing -Regression testing – Internalization testing – Ad hoc testing – Testing of object oriented systems – Usability and accessibility testing.

UNIT – V TEST MANAGEMENT AND AUTOMATION 9 Introduction – Test Planning – Test Management –Software test automation – Scope of automation – Test automation tools – Generic requirement for test tool/framework – Selecting a test tool – Challenges in automation.

Total: 45 hours

REFERENCES:

1. Nina S Godbole, "Software Quality Assurance: Principles and Practice", Narosa Publishers, New Delhi, 2004.
2. Gopalswamy Ramesh and Srinivasan Desikan, "Software Testing: Principles and Practices", Pearson Education, New Delhi, 2006.
3. Mordechai Ben-Menachem/Garry S. Marliss, " Software Quality",Thomson Learning publication, 1997.
4. Ilene Burnstein, "Practical Software Testing", Springer – Verlag, New Delhi, 2003.
5. Stephen H Kan, "Metrics and Models in Software Quality Engineering", Pearson Education, New Delhi, 2002.
6. William E Perry, "Effective Methods for Software Testing", Wiley, New York, 2000.

P15MIT522 SWARM INTELLIGENCE 3 0 0 3

COURSE OUTCOMES

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

1. Explain the fundamentals of Swarm Intelligence
2. Choose appropriate evolutionary computation technique to solve optimization problems
3. Explain the principles of Particle Swarm and Honey Bee's intelligence
4. Apply Bee's intelligence in WSN and online recommendation systems
5. Explain the principles of Ant colony optimization and apply it in optimization problems

UNIT I FUNDAMENTALS 9

Swarm Intelligence Vs Artificial Intelligence, Cellular Automata and the edge of chaos, Artificial life in computer programs –Intelligence in people –Intelligence in Machines, Binary optimization

UNIT II EVOLUTIONARY COMPUTATION THEORY AND PARADIGMS 9

Evolutionary Computation History, Genetic Algorithms: An Overview -A Si mple GA Example Problem – Schemata and the Schema Theorem, Evolutionary Programming, Evolution Strategies.

UNIT III PARTICLE SWARM AND BEE INTELLIGENCE 9

Particle Swarm and Particle Swarm Intelligence –Honey Bee's Intelligence: Bee's Mating Intelligence – Bee's Foraging Intelligence.

UNIT IV APPLICATIONS OF BEE'S INTELLIGENCE 9

Energy minimization in wireless Sensor Networks using Bee's Mating Intelligence, Band width estimation using Bee's Foraging Intelligence, Online recommendation system using Bee's Foraging Intelligence, Determination of traverse path of Mobile sink node in WSN using Bee's Foraging Intelligence.

UNIT V ANT COLONY OPTIMIZATION 9

Introduction to Ant Systems, Ant Colony Optimization Technique, Pheromones and its Density as Deciding Factor, Applications of Ant Colony Optimization in Travelling Salesman Problem and Routing. Comparison between ACO and PSO swarm intelligence models.

Total : 45 hours

REFERENCES:

1. James Kennedy, Russell C. Eberhart, with Yuhui Shi, "Swarm Intelligence", Morgan Kaufmann, 2001.
2. Andries P. Engelbrecht, "Computational Swarm Intelligence", John Wiley, & Sons, 2006.
3. Eric Bonabeau, Marco Dorigo, and Guy Theraulaz, "Swarm Intelligence: From Natural to Artificial Systems", Oxford University Press, 1999.
4. Andries P. Engelbrecht , "Fundamentals of Computational Swarm Intelligence", Wiley, 2008.

Sona College of Technology, Salem
(An Autonomous Institution)
Courses of Study for ME IV Semester under Regulations 2015
Information Technology
Branch: M.Tech. Information Technology

S. No	Course Code	Course Title	Lecture	Tutorial	Practical	Credit
Practical						
1	P15MIT401	Project Phase – II	0	0	24	12
					Total Credits	**12**

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

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