Dr.M.G.R.
EDUCATIONAL AND RESEARCH INSTITUTE
UNIVERSITY
(Decl. U/S 3 of the UGC Act 1956)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M.Tech – Computer Science Engineering (Full Time)
Curriculum and Syllabus
2016 Regulation
To be implemented from 2016-2017 Batch Students

S.No	Sub.Code	Title of Subject	L	T	P	C
		I SEMESTER				
1	MMA160008 *	Applied Mathematics for Computer Engineers	3	1	0	4
2	MCS16C001	Advanced Data Structures and Algorithms	3	1	0	4
3	MCS16C002	Object Oriented Software Engineering	3	0	0	3
4	MCS16C003	Computer Network Management	3	0	0	3
5	MCS16C004	Computer Architecture & Design	3	1	0	4
6	MCS16C005	Advanced Operating Systems	3	1	0	4
7	MCS16CL01 *	Advanced Data Structures Lab	0	0	3	1
8	MCS16CL02 *	Computer Network Management Lab	0	0	3	1
		Total	**18**	**4**	**6**	**24**

S.No	Sub.Code	Title of Subject	L	T	P	C
		II SEMESTER				
1	MCS16C006 *	Compiler Design and Optimization	3	1	0	4
2	MCS16C007	Advanced Database Technology	3	1	0	4
3	MCS16C008	Data mining and Machine Learning Techniques	3	1	0	4
4	MCS16C009	Advanced Web Technology	3	1	0	4
5	MCS16CEXX	Elective I	3	0	0	3
6	MCS16CL03 *	Term Paper & Seminar	0	1	3	2
7	MCS16CL04	Data Mining Lab	0	0	3	1
8	MCS16CL05 *	Complier & Database Lab	0	0	3	1
		Total	**15**	**5**	**9**	**23**

S.No	Sub.Code	III SEMESTER Title of Subject	L	T	P	C
1	MCS16CC003	Cloud Computing	3	1	0	4
2	MCS16CEXX	Elective II	3	0	0	3
3	MCS16CEXX	Elective III	3	0	0	3
4	MCS16CEXX	Elective IV	3	0	0	3
5	MCS16CL06 *	Project Work Phase-I	0	0	6	3
		Total	**12**	**1**	**6**	**16**

S.No	Sub.Code	IV SEMESTER Title of Subject	L	T	P	C
1	MCS16CL07 *	Project Work Phase-II	0	0	24	12
		Total	**0**	**0**	**24**	**12**

* These subjects have the same syllabus from 2013 Regulation

Summary of Credits:

1st Semester Credits   24
2nd Semester Credits   23
3rd Semester Credits   16
4th Semester Credits   12

Total   75

M.Tech - Computer Science and Engineering – 2016 Regulation

S.No	Sub.Code	Title of Subject	L	T	P	C
Elective I

S.No	Sub.Code	Title of Subject	L	T	P	C
1	MCS16CE01	Mobile and Pervasive Computing	3	0	0	3
2	MCS16CE02	Internet of Things	3	0	0	3
3	MCS16I001	Information Security Management Systems	3	0	0	3
4	MCS16IE04 *	Business Continuity and Disaster Recovery	3	0	0	3

Elective II, III and IV

S.No	Sub.Code	Title of Subject	L	T	P	C
1	MCS16CE03	Secure Network Design	3	0	0	3
2	MCS16CE04	Big Data Technology	3	0	0	3
3	MCS16CE05	Soft Computing	3	0	0	3
4	MCS16CE06 *	Ethical Hacking and Digital Forensics	3	0	0	3
5	MCS16CE07 *	Natural Language Processing	3	0	0	3
6	MCS16CE08 *	Pattern Recognition	3	0	0	3
7	MCS16CE09 *	Multi Core Programming	3	0	0	3
8	MCS16CE10	Advanced Wireless Technologies	3	0	0	3
9	MCS16CE11 *	Service Oriented Architecture	3	0	0	3
10	MCS16IE09	Internet Security	3	0	0	3
11	MCS16CE12	Ad- hoc and Wireless Sensor Networks	3	0	0	3
12	MCS16CE13	Social Network Analysis	3	0	0	3
13	MCS16CE14	Principles of Secure Coding	3	0	0	3
14	MCS16CC005 *	Data cloud and Storage Technology	3	0	0	3
15	MCS16CE15	High Speed Networks and Security	3	0	0	3
16	MCS16CE16	Virtualization Technologies	3	0	0	3
17	MCS16CE17	Research Methodology	3	0	0	3
18	MCS16CE18	Cryptography And Network Security	3	0	0	3

MMA160008	APPLIED MATHEMATICS FOR COMPUTER ENGINEERS	L T P C 3 1 0 4

OBJECTIVES:
- ➢ Students will be able to understand and solve problems on the mathematical concepts of algebraic structures, formal languages, automata theory and interpolation.
- ➢ Numerical differentiation and Integration.

UNIT I   ALGEBRAIC STURCTURES   12 Hrs

Groups (Definition and Examples) – Subgroups – Permutation groups – Homomorphism – Kernel – Cosets – Lagrange's theorem – Rings – Fields (Definition and Examples).

UNIT II   FORMAL LANGUAGES   12 Hrs

Regular expressions– Grammars – Context sensitive grammar – Context free grammar – Derivation trees – Finite state machine.

UNIT III   AUTOMATA THEORY   12 Hrs

Finite State Automata (FSA) – Deterministic FSA – Non-Deterministic FSA – Push Down Automata – Turing machine.

UNIT IV   INTERPOLATION   12 Hrs

Newton forward and backward differences – Central differences – Stirling's and Bessel's formulae – Interpolation with Newton's divided differences – Lagrange's method.

UNIT V   NUMERICAL DIFFERENTIATION AND INTEGRATION   12 Hrs

Numerical differentiation with interpolation polynomials – Numerical integration by Trapezoidal and Simpson's (both $1/3^{rd}$ & $3/8^{th}$) rules – Two and three point Gaussian Quadrature formulae – Double integrals using Trapezoidal and Simpson's rules.

Total no. of hrs: 60

REFERENCES:
1. Tremblay J.P., Manohar R., (2004) *Discrete Mathematical structures with applications to Computer science*, Tata McGraw Hill Publishing Co.
2. Kenneth Rosen (2007) *Discrete Mathematics and its applications (SIE)*, Tata McGraw Hill Publishing Co.
3. John C. Martin (2003), *Introduction to languages and the theory of computation (3rd ed.)*, Mcgraw Hill
4. Hopcroft J.E., Ullman J.D. (2002) *Introduction to Automata theory, Languages and Computation*, Narosa Publishing house
5. Veerarajan T. (2005) *Numerical Methods*, Tata McGraw Hill Publishing Co.
6. Sastry S.S. (2003) *Introductory Methods of Numerical Analysis*, Prentice Hall of India

	L	**T**	**P**	**C**
MCS16C001 ADVANCED DATA STRUCTURES AND ALGORITHMS	**3**	**1**	**0**	**4**

OBJECTIVES:
➢ To extend the Students' knowledge of algorithms and data structures.
➢ To enhance their expertise in algorithmic analysis and algorithm design techniques.
➢ To learn a variety of useful algorithms and techniques and extrapolate from them in order to then apply those algorithms and techniques to solve problems.

UNIT I: LINEAR AND NON-LINEAR DATA STRUCTURES   **12 Hrs**
Stacks, Queues & Lists Implementation and Applications – Cursor implementation of Linked Lists – Complexity and Evaluation of Algorithms - Trees – Binary Trees – Binary Search Tree – Tree Traversals – AVL Trees – Splay Trees.

UNIT II: SEARCHING AND SORTING   **12 Hrs**
Sequential search – Binary search – Sorting Techniques: Bubble sort, Selection sort, Insertion sort, Heap sort, Merge sort, Quick sort and Radix sort.

UNIT III: ALGORITHMS   **12 Hrs**
Knapsack Algorithm – Kruskal's Algorithm – Prim's Algorithm – Travelling salesperson problem Algorithm – N-Queens Problem – Branch and Bound – Divide and Conquer – Lower Bound Theory.

UNIT IV: GRAPH AND PARALLEL ALGORITHMS   **12 Hrs**
Graphs – representations – traversals: BFS, DFS – Dijkstra's Algorithm – bi-connected and strongly connected components – parallel algorithms – sorting – matrix multiplication.

UNIT V: SELECTED TOPICS   **12 Hrs**
NP completeness – approximation algorithms – NP hard problems – magic square.

Total no.of Hours:60

REFERENCES:
1. E. Horowitz, S. Sahani & Mehta (1999) *Fundamentals of Data Structures in C++*, Galgotia
2. Langsman, Augestein & Tanenbaum (2002) *Data Structures Using C & C++*, (2nd ed.), PHI
3. T.H. Cormen, C.E. Leiserson, R.L. Rivest (1994) *Introduction to Algorithms*, McGraw Hill
4. Weiss (2003) *Data Structures and Algorithm Analysis in C++* (2nd ed.) Pearson Education
5. M.J. Quinn (1998), Designing Efficient Algorithms for Parallel Computers, McGraw Hill
6. Kenneth A. Berman & Jerome L. Paul (2003) *Fundamentals of Sequential and Parallel Algorithms*, Thomson Learning

			L	**T**	**P**	**C**

MCS16C002   OBJECT ORIENTED SOFTWARE ENGINEERING   3   0   0   3

OBJECTIVES:
- ➢ To understand the importance of object oriented software engineering.
- ➢ To study the various lifecycle models for developing softwares.
- ➢ To analyze and design software using tools.
- ➢ To develop efficient software, deploy and maintain after production.

UNIT I: SOFTWARE ENGINEERING METHODS: **9 Hrs**
Historical, Economic and Maintenance aspects - Introduction to OO Paradigm - Different phases in structured paradigm and OO Paradigm - Software Process - different life cycle models - corresponding strengths and weaknesses - Software Development Models – MVC Architecture – Re-Engineering – OCL.

UNIT II: PLANNING, ESTIMATION & TOOLS
**   FOR STEP WISED REFINEMENT:**   **9 Hrs**
Estimation of Duration and Cost – COCOMO - Project Management plan, Cost - Benefit analysis, Software metrics - CASE tools - Taxonomy and scope of CASE tools.

UNIT III: MODULES TO OBJECTS: **9 Hrs**
        Cohesion and Coupling - Data Encapsulation and Information hiding – Inheritance - polymorphism and Dynamic Binding – Reusability - Portability - Interoperability

UNIT IV: REQUIREMENT & ANALYSIS PHASES: **9 Hrs**
        Rapid Prototyping method - Specification phase - Specification Document - Formal methods of developing specification document - Use case Modeling - Class Modeling - Dynamic Modeling .

UNIT V: DESIGN PHASE & IIM PHASES: **9 Hrs**
        Data oriented design - Object Oriented design - Formal techniques for detailed design - Challenges in design phase - Implementation - Integration and maintenance phases - OOSE aspects in these phases- Testing – CASE TOOLS

                                                Total no.of Hours:45

REFERENCES:
1. Stephen R. Schach, *Object oriented and Classical Software Engineering*, (7th ed.), , TMH
2. Timothy Lethbridge, Robert Laganiere *Object oriented and classical software Engineering*,TMH
3. Ivica Crnkovic (CBSE 2004) *Component-based software engineering*, 7th international symposium, Springer.
4. Yogesh Singh, Ruchika Malhotra, Object Oriented Software Engineering, PHI Learning PVT LTD, 2012.

		L	T	P	C
MCS16C003	**COMPUTER NETWORK MANAGEMENT**	**3**	**0**	**0**	**3**

OBJECTIVES:
➢ To ensure a comprehensive understanding of computer network communication architectures.
➢ To study mathematical models related to network performance analysis.
➢ To focus on current and emerging networking technologies.

UNIT-I: NETWORK ARCHITECTURE: **9 Hrs**
Layering & Protocols - OSI - TCP /IP Architecture - Network Topology - Link& Medium access Protocols – ARP – RARP - IEEE 802.3 – Token Bus – Token Ring – IEEE 802.11 Standards .

UNIT-II: NETWORK LAYER: **9 Hrs**
Internetworking – Ipv4 – Fragmentation and Reassembly - Routing Protocols - Routing Algorithms – OSPF – RIP – BGP – Subnetting - Supernetting – IP v6.

UNIT-III: TRANSPORT AND APPLICATION LAYER   **9 Hrs**
Transport Layer- UDP - TCP - Congestion Control –Application Layer: Telnet – HTTP - FTP -E-mail- DNS.

UNIT-IV: SNMP MANAGEMENT   **9 Hrs**
Monitoring & Control - SNMPv1 – organization and information models – SNMP V2 - V3.

UNIT-V: NETWORK MONITORING AND APPLICATIONS: **9 Hrs**
RMON 1- RMON 2 - Broadband Network Management- Network Management Tools and Systems.
     Total No.of Hours: 45

REFERENCES
1.Peterson Davie (2000) Computer Networks - A System Approach (2nd ed.), Morgan Kauffman Harcourt.
2.Mani Subramanian (2000) Network Management Principles and Practice Pearson education
3. William Stallings (1999), SNMP, SNMPV2, SNMPV3, RMON(1st , 2nd & 3rd ed.), Addison Wesley
4. Computer Networking: A Top-Down Approach / Edition 6 by James F. Kurose, Keith W. Ross, Pearson, 2012.

		L	T	P	C
MCS16C004	**COMPUTER ARCHITECTURE & DESIGN**	**3**	**1**	**0**	**4**

OBJECTIVES:
➢ To ensure a comprehensive understanding the design of advanced Computer Architectures.
➢ To focus on current and emerging design technologies in computer architecture.

UNIT-I: INTRODUCTION   **12 Hrs**

Overview of CPU - Memory - I/O Design – Instruction sets of different machines – Addressing modes – Instruction Formats – Introduction to Register transfer notation – abstract and concrete RTN - Performance evaluation.

UNIT-II: CPU ARCHITECTURE   **12 Hrs**

CISC and RISC Processors Specification – Simple RISC Computer (SRC) design - Pipelining and Hazards – Super Scalar Architectures – Multicore Architecture.

UNIT-III: MEMORY DESIGN   **12 Hrs**

Virtual Memory – Cache memory – Cache Design for multiprocessor environments – Cache Protocols – evaluating memory performance.

UNIT-IV: I/O DESIGN   **12 Hrs**

I/O subsystems – Programmed I/O – I/O Interrupts – DMA – Speed Limits – Interfacing to different types of I/O Devices – Performance measures.

UNIT-V: PARALLEL ARCHITECTURES   **12 Hrs**

Data Flow – Vector Processors – Multi Processor Architecture – Flynn Classifications – SIMD - MIMD – Multi Computer Architecture – Interconnection Networks.

Total no.of Hours: 60

REFERENCES
1. Vincent P. Heuring, Harry F. Jordan (2003), *Computer Systems Design and Architecture*, Pearson Education
2. Stallings, *Computer Organization and Architecture: Designing for Performance* (6th ed.), PHI
3. John P. Hayes (2003) *Computer Organization and Architecture*, Tata McGraw Hill
4. D. A. Patterson & J. L. Hennessy (1996), *Computer Architecture – A Quantitative Approach*, (2nd ed.), Morgan Kaufmann Publishers.

		L	**T**	**P**	**C**
MCS16C005	**ADVANCED OPERATING SYSTEMS**	**3**	**1**	**0**	**4**

OBJECTIVES:
- ➢ To understand the concepts of Advanced Operating systems
- ➢ To understand the concepts of advanced OS such as distributed file systems
- ➢ To understand the design issues for distributed systems and programs

UNIT I - INTRODUCTION   **12 hours**
Operating Systems Concepts – System Calls – OS Organization – Factors in OS Design – Basic Implementation Considerations – Time Sharing and Multi Programming – Real Time Systems.

UNIT III - PROCESS MANAGEMENT   **12 hours**
Process Management: Process Concepts, Model – Process Synchronization – Process Scheduling - Threads - Dead Lock: Detection & Recovery – Avoidance - Prevention- Two Phase Locking Issues – Semaphores.

UNIT III - MEMORY MANAGEMENT   **12 hours**
Basic Memory Management – Swapping – Virtual Memory - Paging– Page Replacement Algorithms- Segmentation – Fragmentation.

UNIT IV DISTRIBUTED OPERATING SYSTEMS   **12 hours**
System Architecture – Design Issues – Communications – Message passing– RPC– Synchronization – Lamport's Clock Synchronization Algorithm– mutual exclusion.

UNIT V - CONSISTENCY, REPLICATION AND FAULT TOLERANCE   **12 hours**
Introduction to Data Centric Consistency Models- Client-Centric Consistency Models-Replica Management -Consistency protocols- Introduction to fault Tolerance - Process Resilience -Distributed Commit - Reliable Client Server Communication.

Total no.of Hours: 60

REFERENCES
1. Abraham Silberschatz and Peter Galvin, "Operating System Concepts", Fifth edition, Addison Wesley, 1998.
2.Andrew S.Tanenbaum, "Modern Operating Systems", 2nd edition, Addison Wesley, 2001.
3. Andrew S. Tanenbaum, "Distributed Operating Systems", Pearson Education, Reprint , 2011.
4. Pradeep K. Sinha, "Distributed Operating Systems Concepts and Design",PHI, 2007
5. Advanced concepts in operating systems: distributed, database, and multiprocessor operating systems Mukesh Singhal, Niranjan G. Shivaratri McGraw-Hill, 1994.

	L T P C
MCS16CL01 ADVANCED DATA STRUCTURES LAB	**0 0 3 1**

OBJECTIVE:

➢ To implement the following list of programs

LIST OF EXPERIMENTS

1. Implementation of stack and queue operations using linked list and array.
2. Implementation of linked lists operations
3. Implementation of sorting techniques
    a. Quick sort b. Merge sort c. Bubble sort
    d. Selection sort e. Insertion sort f. Shell and heap sort
4. Implementation of Searching techniques
    a. Linear search b. Binary search
5. Expression evaluation of Infix to Postfix
6. Binary tree representation and traversal techniques
7. Depth first search
8. Breadth first search
9. Single source shortest path algorithm
10. Single search shortest path

MCS16CL02   COMPUTER NETWORK MANAGEMENT LAB   0 0 3 1

OBJECTIVE:

➢ To implement the following list of programs

LIST OF EXPERIMENTS
1. Client server Chat Program Using TCP
2. Client-Server Chat Using UDP
3. Printing the Client Address at the Server end
4. Date-Time Server
5. File Transfer Using TCP
6. Simulation of Sliding Window Protocol
7. Domain Name System
8. Simulation of Routing Protocols
9. Uniform Resource Locator (URL)
10. Multiclient-Server Chat
11. Simulation of Simple Network Management Protocol
12. Invoke a remote method.

		L	**T**	**P**	**C**
MCS16C006	**COMPILER DESIGN AND OPTIMIZATION**	**3**	**1**	**0**	**4**

OBJECTIVES:
➢ To understand the various optimization techniques about compiler's instruction selection and scheduling techniques.
➢ To explore how parallelism is handled by compilers and understand how compilers deal with pipelining architecture to just-in-time compilations

UNIT-I: INTRODUCTION 12 Hrs
Compilers-Grammars-Languages-Phases of compiler-compiler writing tools-Errors-Lexical phase errors, syntactic phase errors, semantic phase errors – Parallel Compilers – Cross Compilers.

UNIT-II: LEXICAL ANALYZER 12 Hrs
Role of lexical analyzer-input Buffering –Specification and Recognition of tokens –Language for specifying Lexical analyzer-Finite Automata-Regular expression to NFA-Optimization of DFA based pattern matches –Design of a Lexical Analyzer Generator

UNIT-III: SYNTAX ANALYZER 12 Hrs
Parsers-CFG-derivations and parse trees-capabilities of CFG- Top Down parsing - Bottom Up parsing - LR parsing- SLR parsing -LALR parsing – CLR parsing – Operator Precedence – Predictive Parsing.

UNIT-IV: INTERMEDIATE CODE GENERATION 12 Hrs
Syntax Directed Translation scheme-Implementation of Syntax Directed Translators-Intermediate code- postfix notation, - parse trees and syntax trees-Trees three address code –Quadruples, Triples – Translation of Assignment statements –Boolean expressions-Declaration –Flow control statements – Back patching.

UNIT-V: CODE OPTIMIZATION 12 Hrs
Principal source of optimization-Issues in the design of a code generator-Run-Time storage management –Basic blocks and flow graphs Next use information-Simple code generator –DAG representation of basic blocks-Peephole optimization – Code Generation

Total no.of Hours:60

REFERENCES:
1. A.V.Aho, Ravi Sethi,J. D.ullman (2013), *Compilers –principles ,Techniques and tools*, Addison Wesley publishing company
2. Allen I.Holub (1993) *Compiler Design in C*, Prentice Hall of India
3. Kenneth C. Louden (2003) *Compiler Construction: Principles & Practice*, Thomson Learning
4. Muchnick, *Advanced Compiler Design: Implementation*, Acadamic Press
5. Rajini Jindal (2002) , *Compilers Construction & Design* , Umesh Publications , Delhi
6. Ronald Mak (1996) *Writing Compilers and Interpreters*, (2nd ed.) , John Miler &Sons

		L	**T**	**P**	**C**
MCS16C007	**ADVANCED DATABASE TECHNOLOGY**	**3**	**1**	**0**	**4**

OBJECTIVES:
➢ Students would be able to Design and implement relational database solutions for general applications.
➢ Develop database scripts for data manipulation and database administration.
➢ Understand and perform common database administration tasks, such as database monitoring, performance tuning, data transfer, and security.
➢ To balance the different types of competing resources in the database environment so that the most important applications have priority access to the resources

UNIT-I: INTRODUCTION TO DATABASE 12 Hrs
Database Environment – Data Models – Relational Model – Relational algebra – SQL: Data Definition - Data Manipulation - Triggers - Query by Example .

UNIT-II: DATABASE PLANNING 12 Hrs
ER Modeling – Mapping ER to Relation - Enhanced ER Modeling –Normalization – I NF – 2 NF – 3 NF – BCNF – 4 NF – 5NF.

UNIT-III: INDEXING AND HASHING 12 Hrs
Indexing – Hashing - basic concepts and B+ tree Indices -static and dynamic hash functions

UNIT-IV: DISTRIBUTED DATABASES 12 Hrs
Distributed DBMS: Introduction, Architecture, Design and Advanced Concepts – Query Processing – Updating Distributed Data – Distributed Transaction Management, Concurrency Control – Security – Recovery.

UNIT-V: XML AND DBMS 12 Hrs
Structured and Semi Structured Data: Implementation of Relation in XML , ODBC and JDBC - XML schema – XML Query language – XML Data Bases.

Total no.of Hours:60

REFERENCES
1. Thomas M Connolly, Carolyn E Begg, Database Systems *A Practical Approach to Design Implementation and Management*, (3rd ed.),Addison Wesley.
2. Bipin C. Desai (2001), *An Introduction to Database Systems*, Galgotia Publications
3. C. J. Date, *An Introduction to Database Systems,* (7th ed.), Pearson Education.
4. Abraham Silberschatz, Henry F Korth, S.Sudershan *Database System Concepts* (4th ed.)
5. Prabhu (2002), *Object Oriented Database Systems: Approaches and Architecture*, PHI
6. Morrison (2003) *Database Driven Websites*, Thomson Learning.

		L	**T**	**P**	**C**
MCS16C008	**DATA MINING AND MACHINE LEARNING**	**3**	**1**	**0**	**4**
	TECHNIQUES				

OBJECTIVES:
➢ To Understand Data mining principles and techniques and Introduce DM as a cutting edge business intelligence
➢ To understand the concepts of machine learning
➢ To appreciate supervised and unsupervised learning and their applications

UNIT – I: INTRODUCTION TO DATA MINING   **12 Hrs**

Data Warehouse Architecture – OLAP - Integration of a Data Mining System with a Data Warehouse - Data Mining goals - Knowledge Representation Methods - Data Mining Techniques - Stages of the Data Mining Process : Data pre-processing ,Data cleaning , Data transformation ,Dimensionality Reduction – Evaluation criteria of Various Mining Techniques - Visualisation Techniques

UNIT – II: CLASSIFICATION and CLUSTERING   **12 Hrs**

Classification Basics - Inferring rudimentary rules: 1R algorithm ,Decision trees ,Covering rules , Entropy and Classification Algorithms - Heuristic Space Search – Fuzzy Representation – Fuzzy sets and Fuzzy reasoning

Clustering - Cluster Analysis - Types of Data – Entropy and Clustering - Categorization of Major Clustering Methods - Kmeans – Nearest Neighbour Analysis - Outlier Analysis - Locally weighted Regression - Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis-

UNIT –III ASSOCIATION RULE MINING   **12 Hrs**

Association rules: Frequent Item Set Generation - Frequent Itemset Generation Strategies, FP-growth Algorithm, Apriori Principle - Apriori Algorithm, ECLAT Algorithm , Association Rule Discovery - rules efficiency ,Correlation analysis , Rules Interestingness, Confidence and Support, Statistical Independance .

UNIT – IV: MACHINE LEARNING ALGORITHMS – I   **12 Hrs**

Artificial Neural Network: Characteristics —Learning in ANN : Supervised and Unsupervised learning , Hebian Learning - Perceptrons – Multilayer Networks and Back Propagation Algorithms – Radial Basis Functions - Kohnen's self organizing networks - Hopfield network

Genetic Algorithm - Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method

UNIT – V: MACHINE LEARNING ALGORITHMS - II   **12 Hrs**

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

Total no.of Hours: 60

REFERENCES:
1. Jiawai Han, MichelineKamber, JianPei , "Data Mining: Concepts and Techniques", 3 rd edition Morgan Kaufman Publications, 2011.
2. Jang J.S.R., Sun C.T. and Mizutani E (2003), "Neuro-Fuzzy and Soft computing", Pearson Education
3. Tom M. Mitchell, "Machine Learning",1st edition McGraw-Hill Science /Engineering /Math, 2010
4. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press 2004.

Dr.M.G.R.

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(Decl. U/S 3 of the UGC Act 1956)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

	L	**T**	**P**	**C**
MCS16C009 ADVANCED WEB TECHNOLOGY	**3**	**1**	**0**	**4**

OBJECTIVES:
- To apply the concept of Client Server architecture.
- To develop web applications using XML standard and ASP.Net control and validation control.
- To design and develop interactive web applications using master page and theme.
- To develop asynchronous web application using database programming and Ajax

UNIT I: FUNDAMENTALS   **12 Hrs**

Introduction to the web - Web- enabling Technologies - Web service Protocol - Web Design concepts – HTML-DHTML – Image maps – CSS.

UNIT II: WEB PROGRAMMING LANGUAGES   **12 Hrs**

XML based standards –Structuring XML document using DTD –Schemas – CGI – PHP – PYTHON – PERL – MySQL.

UNIT III: CLIENT AND SERVER SIDE SCRIPTING   **12 Hrs**

JavaScript –Data types –Variables –Operators –Control statements –Functions –Objects and arrays –Windows and frames –Forms. AJAX –XMLHttpRequest (XHR) –Create Object –Request – Response – ASP – ASP objects –Response –Request –Server –Session –File access –Working with ASP components

UNIT IV: ASP.Net and WEB PROGRAMMING   **12 Hrs**

Basics of ASP.NET – Features of ASP.NET – Web Applications and Webpage – Components of Web application – Client Server Architecture – Creating simple Web Application in ASP.NET – Introduction to Visual Studio – Creating a New Web Project (ASP.NET) – Building Web Sites – Working with ASP.Net Web Forms – ASP.Net Files –ASP.Net Objects (Request, Response, Server, Application, Session)

UNIT V: DATABASE PROGRAMMIN G USING ADO.NET AND AJAX   **12 Hrs**

ADO.Net Architecture -ADO.Net Components – Connection Object – Command Object – DataReader – DataSets & Data Adapter , DataView. Data binding concept on and Data Bound Controls- Insert, Update, Delete and DataBinding operation using Data Grid – Data List and Repeater Control. Develop simple web application with AJAX controls - ASP.Net AJAX Control – Ajax Framework – ScriptManager.

                                                                 Total no.of Hours: 60

REFERENCES:
1. Deitel and Deitel (2000), *Internet and World Wide Web how to program*, Prentice Hall
2. Goldfarb (2000), *The XML handbook* , (2nd ed.), Pearson Education.
3. Matthew Macdonald (2002) , ASP.NET: The Complete Reference Book
4. Shelly, cashman, Quasney (2012), Visual Basic .net Comprehensive Concepts and Techniques.
5. Otey,(2003), Ado.Net: The Complete Reference.

MCS16CL04   DATA MINING LAB   0 0 3 1

OBJECTIVES:
- ➢ Able to write simple programs using Rattle an open source Tool(R)
- ➢ Able to write simple programs using Weka machine learning toolkit

1. Introduction to exploratory data analysis using Rattle an open source Tool(R)
2. Introduction to regression using Rattle an open source Tool. (R)
3. Introduction to the Weka machine learning toolkit
4. Classification using the Weka toolkit – Part 1
5. Classification using the Weka toolkit – Part 2
6. Performing data preprocessing for data mining in Weka
7. Performing clustering in Weka
8. Association rule analysis in Weka
9. Data mining case study using the CRISP-DM standard
10. Data mining case study using the CRISP-DM standard

SPSS – Statistical analysis and modeling; decision tree
MATLAB & SCILAB – Genetic Algorithm and Neural Network
SVM tool

MCS16CL05   COMPILER & DATABASE LAB   0 0 3 1

OBJECTIVE:

➢   To implement the following list of programs

LIST OF EXPERIMENTS

> **COMPILER LAB**
> 1. Implementation of Lexical Analyzer
> 2. Creation of Symbol Table
> 3. Implementation of Assembler
> 4. DFA From Regular Expression
> 5. Implementation of Top Down Parser
> 6. Implementation of Operator Precedence Parser
>
> **DATABASE LAB**
> 1. Finding Rank Holders Using Cursors
> 2. Creation of Trigger
> 3. PL/SQL Procedure to Insert A Row
> 4. Student Information System
> a. Queries On Student marks
> b. Queries on Student Details
> 5. Employee payroll System
> 6. Finding total & average using functions

		L	**T**	**P**	**C**
MCS16CC003	**CLOUD COMPUTING**	**3**	**1**	**0**	**4**

OBJECTIVES:
- To Understand Cloud characteristics and cloud reality.
- To understand cloud infrastructure
- To understand cloud services.
- To analyze Quality of Service issues.

UNIT I   INTRODUCTION   12Hrs

Introduction - Essentials - Benefits - Business and IT Perspective - Cloud and Virtualization -Cloud Services Requirements - Cloud and Dynamic Infrastructure - Cloud Computing Characteristics - Cloud Adoption. Cloud Models - Measured Service -- Public versus Private Clouds - Cloud Infrastructure Self Service.

UNIT II   CLOUD INFRASTRUCTURE   12Hrs

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 III   SAAS AND PAAS   12Hrs

Getting started with SaaS- Understanding the multitenant nature of SaaS solutions- Understanding OpenSaaS Solutions- Understanding Service Oriented Architecture- PaaS- Benefits and Limitations of PaaS.

UNIT IV   IAAS AND CLOUD DATA STORAGE   12Hrs

Understanding IaaS - Improving performance through Load balancing- Server Types within IaaS solutions- Understanding Cloud based data storage - Cloud based database solutions- GFS and HDFS-BigTable - HBase and Dynamo - Map-Reduce and extensions: Parallel computing - The map-Reduce model - Parallel efficiency of Map-Reduce - Relational operations using Map-Reduce - Enterprise batch processing using Map-Reduce

UNIT V   QOS ISSUES IN CLOUD COMPUTING   12Hrs

Implementing real time application over cloud platform Issues in Intercloud environments- QOS Issues in Cloud- Dependability- data migration- streaming in Cloud - Quality of Service (QoS) monitoring in a Cloud computingenvironment -Cloud Middleware - Mobile Cloud Computing - Inter Cloud issues. A grid of clouds,Sky computing - load balancing - resource optimization - resource dynamic reconfiguration - Monitoring in Cloud.

Total No of Hours: 60

Reference Books:
1. Kumar Saurabh, "Cloud Computing: Insights into New-Era Infrastructure", Wiley India, 2011.
2. Anthony T .Velte, Toby J.Velte, Robert Elsenpeter, "Cloud Computing: A Practical Approach", Tata McGraw Hill Edition, Fourth Reprint, 2010.
3. Kris Jamsa, "Cloud Computing: SaaS, PaaS, IaaS, "Virtualization, Business Models, Mobile, Security and more", Jones & Bartlett Learning Company LLC, 2013.
4. Barrie Sosinsky (2011) Cloud Computing Bible, Wiley, India
5. Gautam Shroff (2010) Enterprise Cloud Computing,Cambridge

MCS16CL06   PROJECT WORK PHASE – I   0   0   6   3

OBJECTIVES:

1. Title Identification

2. Title Confirmation

3. Problem Scenario and Definition

4. Feasibility Study and Requirement Specification

5. Solution Approach

6. Architectural Design / Data Flow Design

7. Solution Design and Workflow

MCS16CL07   PROJECT WORK PHASE – II   0   0   24   12

OBJECTIVES:

- Detailed Design and Implementation
- Test Plan
- Partial Demo
- Packaged Demo
- Documentation verification

L	**T**	**P**	**C**

MCS16CE01   MOBILE AND PERVASIVE COMPUTING   3   0   0   3

OBJECTIVES :
➢ To understand the basics of Mobile computing and Personal computing.
➢ To learn the role of wireless networks in Mobile Computing and Pervasive Computing.
➢ To study about the underlying wireless networks.
➢ To understand the architectures of mobile and pervasive applications.
➢ To become familiar with the pervasive devices and mobile computing platforms.

UNIT I   INTRODUCTION   9 Hrs
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 – Standards Bodies– Pervasive Computing – Basics and Vision – Principles of Pervasive Computing – Categories of Pervasive Devices

UNIT II   3G AND 4G CELLULAR NETWORKS   9 Hrs
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 3.9G 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   9 Hrs
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   9 Hrs
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

UNIT V   APPLICATION DEVELOPMENT   9 Hrs
Access Devices – PDAs and Smart Phones – Smart Cards and Embedded Controls – J2ME – Programming for CLDC – GUI in MIDP – Application Development on Android – KOS – SQL lite.
                                                                     Total No of Hours: 45

REFERENCES:
1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, "Mobile Computing: Technology, Applications and Service Creation", Second Edition, 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. Stefan Poslad, "Ubiquitous Computing: Smart Devices, Environments and Interactions", Wiley

		L	**T**	**P**	**C**
MCS16CE02	**INTERNET OF THINGS**	**3**	**0**	**0**	**3**

OBJECTIVES:
- ➢ To understand the basics of Internet of Things
- ➢ To get an idea of some of the application areas where Internet of Things can be applied
- ➢ To understand the middleware for Internet of Things
- ➢ To understand the concepts of Web of Things
- ➢ To understand the concepts of Cloud of Things with emphasis on Mobile cloud computing
- ➢ To understand the IOT protocol

UNIT I   INTRODUCTION   9 Hrs
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   9 Hrs
IPv6 – 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   9 Hrs
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   INTEGRATION   9 Hrs
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   9 Hrs
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 No of Hours: 45

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

		L	**T**	**P**	**C**
MCS16I001	**INFORMATION SECURITY MANAGEMENT SYSTEMS**	**3**	**0**	**0**	**3**

OBJECTIVES:
➢ Gaining knowledge about information security
➢ Comprehend the history of computer security and how it evolved into information security.
➢ Outlines the phases of the security systems development life cycle, the roles of professionals involved in information security within an organization.
➢ Detailed study of HIPAA.
➢ Knowledge about PCI¬ & Octave Methods.

UNIT 1 INTRODUCTION   **9 Hrs**
Information Security concepts - Critical Characteristics of Information - Components of an Information System, balancing information security and access – Systems Development Life Cycle - Security SDLC – Security professionals and organization –communities of interest

UNIT II SECURITY INVESTIGATION   **9 Hrs**
Need for Security - Business Needs - Threats – Attacks - secure software development - Legal, Ethical and Professional Issues in Information Security

UNIT III PLANNING FOR SECURITY   **9 Hrs**
Information security planning and governance – policy and practices- blue print for security – training and awareness – continuity strategies

UNIT IV SECURITY TECHNOLOGIES   **9 Hrs**
Access control – Firewalls – protecting remote connections- IDPS – Honeypots, honeynets and padded cell systems – scanning and analysis tools- biometric access controls

UNIT V IMPLEMENTING SECURITY   **9 Hrs**
Information Security Project management – technical and nontechnical aspects – certification and accreditations- credentials for security professionals- security management maintenance models
                                                                Total No of Hours: 45

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. Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series: Computer Forensics)
6. CyberForensics: Understanding Information Security Investigations (Springer's Forensic Laboratory Science Series by Jennifer Bayuk Sep 9, 2010.

		L	**T**	**P**	**C**
MCS16IE04	**BUSINESS CONTINUITY & DISASTER RECOVERY**	**3**	**0**	**0**	**3**

OBJECTIVES:
➢ Develop basic understanding of threat and recovery planning and risk Management
➢ Analysis of mitigation strategy development.
➢ Understand the IT and non IT disasters and planning development techniques
➢ Understand the testing¬ and auditing methods.

UNIT-I: BUSINESS CONTINUITY AND DISASTER RECOVERY AND RISK MANAGEMENTBASICS   **9Hrs**

Overview - definition-Components of business-The cost of planning versus the cost of failure-Types of disastersElectronic data threats- Business continuity and disaster recovery planning – basics Risk Management Basics-Principle, process, Technology and Infrastructure in Risk Management-IT specific Risk Management-Risk assessment Components-Information gathering methods-Natural and environmental threats human threats-Infrastructure threats-Threat checklist-Threat Assessment Methodology-Vulnerability assessment.

UNIT II BUSINESS IMPACT ANALYSIS AND MITIGATION STRATEGY DEVELOPMENT   **9Hrs**

Introduction- Business Impact Analysis Overview-Understanding Impact Critically-Identifying business functionsMarketing and sales-Operations-Research and development-Warehouse- Gathering data for the Business Impact Analysis-Determining the Impact- Business Impact Analysis data points-Preparing the Business Impact Analysis report – mitigation strategy development Introduction-Types of Risk Mitigation strategies-The Risk Mitigation process- Developing your Risk Mitigation Strategy-People, mitigation and infrastructure-IT Risk mitigation-Backup and recovery consideration

UNIT III   DISASTER RECOVERY   **9Hrs**

Introduction-Data Disasters-Virus Disasters-Communication System Disaster-Software Disasters-Data centre Disasters-IT Staff Disasters-IT Vendor Disasters-IT Project Failures-Information Security-Disaster Recovery ToolsIntroduction to Non-IT Disasters-Disaster Recovery At Home.

UNIT IV   PLAN DEVELOPMENT   **9Hrs**

Introduction-Phase of the Business continuity and disaster recovery-Defining BC/DR teams and key personnelDefining task and assigning resources-Communication Plans-Event logs,, change controls and appendicesemergency response and recovery Introduction-Emergency management overview response plan-Crisis Management-Disaster Recovery-IT Recovery tasks.

UNIT V TRAINING, TESTING AND AUDITING AND BC /DR PLAN MAINTENANCE   **9Hrs**

Introduction-Training forBusiness continuity and disaster recovery-Testing the BC/DR plan-Performing IT System and Security auditsBC/DR plan maintenance Introduction-BC/DR Plan Change Management-Strategies for managing change-BC/DR plan Audit-Plan Maintenance Activities-Project close out.

                                                     Total No of Hours: 45

Reference Books:

1.Susan Snedaker , (2007)Business Continuity and Disaster Recovery Planning for IT Professionals
2. B S Thejendra,(Jan 8,2008)Disaster Recovery and Business Continuity ,(2nd ed.),
3.John RittinghousePhD ,CISM ,James F. Ransome PhD CISM CISSP,(2004)Business Continuity and Disaster Recovery for InfoSec Managers
4. Deborah C. Miller (2011) Business Continuity and Disaster Recovery: Getting Started Guide Concepts and Definitions for Common Sense Planning
5Erbschloe, (2003)Guide to Disaster Recovery,Michael
6. Gerard Blokdijk Jackie Brewster , Ivanka ,Disaster Recovery and Business Continuity IT Planning, Implementation, Management and Testing of Solutions and Services Workbook

MCS16CE03	SECURE NETWORK DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

➢ Understand security best practices and how to take advantage of the networking gear that is already available
➢ Learn design considerations for device hardening, Layer 2 and Layer 3 security issues, denial of service, IPSec VPNs, and network identity
➢ Understand security design considerations for common applications such as DNS, mail, and web.
➢ Identify the key security roles and placement issues for network security elements such as firewalls, intrusion detection systems, VPN gateways, content filtering, as well as for traditional network infrastructure devices such as routers and switches.
➢ Understand the various testing and optimizations strategies to select the technologies and devices for secure network design.

UNIT I   NETWORK SECURITY FOUNDATIONS   9 Hrs

A fundamental framework for network security – need for user level security on demand – Network Security Axioms – security policies and operations life cycle – security networking threats – network security technologies – general and identity design considerations – network security platform options and best deployment practices – Firewalls – Types – secure network management and network security management.

UNIT II   IDENTIFYING SYSTEM DESIGNER'S NEEDS AND GOALS   9 Hrs

Evolution of network security and lessons learned from history – 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 III   PHYSICAL SECURITY ISSUES AND LAYER 2 SECURITY
**   CONSIDERATIONS   9 Hrs**

Control physical access to facilities – Control physical access to data centers – Separate identity mechanisms for insecure locations – Prevent password-recovery mechanisms in insecure locations – awareness about cable plant issues – electromagnetic radiation and physical PC security threats – L2 control protocols – MAC flooding considerations – attack mitigations – VLAN hopping attacks – ARP – DHCP – PVLAN security considerations – L2 best practice policies.

UNIT IV   IP ADDRESSING AND ROUTING DESIGN CONSIDERATIONS 9 Hrs

Route summarizations – ingress and egress filtering – Non routable networks – ICMP traffic management – Routing protocol security – Routing protocol authentication – transport protocol management policies – Network DoS – flooding attacks.

UNIT V   TESTING AND OPTIMIZING SYSTEM DESIGN   9 Hrs

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) – Modeling – simulation and behavior analysis of security attacks.

Total No of Hours: 45

REFERENCES:

1. Sumit Ghosh, "Principles of secure network system design", Springer-Verlag, NY,2002. (UNIT I)
2. Sean Convery, "Network security architecture", Cisco Press, 2004. (UNIT III & IV)
3. Priscilla Oppenheimer, "Top-Down network Design", Thrid edition, Cisco press, 2012. (UNIT II & V).
4. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fourth Edition, Morgan Kauffmann Publishers Inc., 2009, Elsevier.
5. William Stallings, "Crpyptography and Network security Principles and Practices", Pearson / PHI, 4th edition, 2006.
6. Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", 2nd edition, Pearson, 2007.

		L	**T**	**P**	**C**
MCS16CE04	**BIG DATA TECHNOLOGY**	**3**	**0**	**0**	**3**

OBJECTIVES:
- To understand big data analytics as the next wave for businesses looking for competitive advantage
- To understand the financial value of big data analytics
- To explore tools and practices for working with big data
- To understand how big data analytics can leverage into a key component
- To understand how to mine the data
- To learn about stream computing
- To know about the research that requires the integration of large amounts of data

UNIT I   INTRODUCTION TO BIG DATA   9 Hrs
Introduction – distributed file system – Big Data and its importance– Four Vs– Drivers for Big data Big data analytics, – Big data applications – Algorithms using map reduce – Matrix-Vector Multiplication by Map Reduce.

UNIT II   INTRODUCTION HADOOP   9 Hrs
Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

UNIT- III   HADOOP ARCHITECTURE   9 Hrs
Hadoop Architecture – Hadoop Storage: HDFS – Common Hadoop Shell commands–, Anatomy of File Write and Read –, NameNode – Secondary NameNode – and DataNode – Hadoop MapReduce paradigm, Map and Reduce tasks – Job – Task trackers - Cluster Setup – SSH & Hadoop Configuration – HDFS Administering –Monitoring & Maintenance.

UNIT-IV   HADOOP ECOSYSTEM AND YARN   9 Hrs
Hadoop ecosystem components - Schedulers - Fair and Capacity– Hadoop 2.0 New Features NameNode High Availability – HDFS Federation – MRv2 – YARN – Running MRv1 in YARN**. –**

UNIT-V   HIVE AND HIVEQL, HBASE   9 Hrs
Hive Architecture and Installation – Comparison with Traditional Database – HiveQL – Querying Data - Sorting And Aggregating – Map Reduce Scripts, Joins & Subqueries, HBase concepts Advanced Usage – Schema Design – Advance Indexing – PIG – Zookeeper - how it helps in monitoring a cluster – HBase uses Zookeeper and how to Build Applications with Zookeeper.

Total No of Hours: 45

REFERENCES
1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk deroos et al. , "Understanding Big data ", McGraw Hill, 2012.
3. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.
4. Vignesh Prajapati, "Big Data Analytics with R and Haoop", Packet Publishing 2013.
5. Tom Plunkett, Brian Macdonald et al, "Oracle Big Data Handbook", Oracle Press, 2014.
6. http://www.bigdatauniversity.com/
7. Jy Liebowitz, "Big Data and Business analytics",CRC press, 2013.

		L	**T**	**P**	**C**
MCS16CE05	**SOFT COMPUTING**	**3**	**0**	**0**	**3**

OBJECTIVES:
➢ To learn the key aspects of Soft computing , Neural networks and fuzzy logic components.
➢ To gain insight onto Neuro Fuzzy modeling and control.
➢ To know about the components and building block hypothesis of Genetic algorithm and knowledge in machine learning through Support Vector Machines.

UNIT I: ARTIFICIAL NEURAL NETWORKS 9 Hrs
Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning -Back propagation networks - Kohnen's self organizing networks -.

UNIT II: EVOLUTIONARY ALGORITHMS 9 Hrs
Hopfield network – Local minima problem – Evolutionary algorithm -. Ant colony – Bee Colony - PSO.

UNIT III: FUZZY SYSTEMS 9 Hrs
Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making**.**

UNIT IV: NEURO - FUZZY MODELING 9 Hrs
Adaptive Neuro Fuzzy Inference Systems – Co-active Neuro Fuzzy Inference Systems – Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation.

UNIT V: GENETIC ALGORITHMS 9 Hrs
Survival of the Fittest - Fitness Computations - Cross over - Mutation -Reproduction - Rank method - Rank space method – tools for genetic algorithm.

Total no.of Hours: 45

REFERENCES
1. Jang J.S.R., Sun C.T. and Mizutani E (2003), "*Neuro-Fuzzy and Soft computing*", Pearson Education
2. Timothy J.Ross (1997), "*Fuzzy Logic with Engineering Applications*", McGraw Hill
3. Laurene Fausett (2003), "*Fundamentals of Neural Networks*", Pearson Education
4. George J. Klir and Bo Yuan (1995), "*Fuzzy sets and Fuzzy Logic*", Prentice Hall, USA
5. Nih J.Nelsson (1998), "*Artificial Intelligence - A New Synthesis*", Harcourt Asia Ltd.
6. D.E . Goldberg (1989), "*Genetic Algorithms: Search, Optimization and Machine Learning*", Addison Wesley,

	L	**T**	**P**	**C**
MCS16CE06 ETHICAL HACKING AND DIGITAL FORENSICS	3	0	0	3

OBJECTIVES:
➢ To learn various hacking techniques and attacks and data assets against attacks from the Internet.
➢ To assess and measure threats to information assets and benefits of strategic planning process.
➢ To evaluate where information networks are most vulnerable and penetration tests into secure networks for evaluation purposes.
➢ To enable students to understand issues associated with the nature of forensics

UNIT I: **9 Hrs**
Hacking windows – Network hacking – Web hacking – Password hacking. A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks.

UNIT II: **9 Hrs**
TCP / IP – Checksums – IP Spoofing port scanning, DNS Spoofing. Dos attacks – SYN attacks, Smurf attacks, UDP flooding, DDOS – Models. Firewalls – Packet filter firewalls, Packet Inspection firewalls – Application Proxy Firewalls. Batch File Programming.

Unit III: **9 Hrs**
Fundamentals of Computer Fraud – Threat concepts – Framework for predicting inside attacks – Managing the threat – Strategic Planning Process.

UNIT IV **9 Hrs**
Architecture strategies for computer fraud prevention – Protection of Web sites – Intrusion detection system – NIDS, HIDS – Penetrating testing process – Web Services – Reducing transaction risks.

UNIT V: **9 Hrs**
Key Fraud Indicator selection process customized taxonomies – Key fraud signature selection process – Accounting Forensics – Computer Forensics – Journaling and it requirements – Standardized logging criteria – Journal risk and control matrix – Neural networks – Misuse detection and Novelty detection.

Total no.of Hours: 45

REFERENCES
1. Kenneth C.Brancik (2008) "*Insider Computer Fraud*" Auerbach Publications Taylor & Francis Group
2. Ankit Fadia (2006) " *Ethical Hacking*" second edition Macmillan India Ltd

		L	**T**	**P**	**C**
MCS16CE07	**NATURAL LANGUAGE PROCESSING**	**3**	**0**	**0**	**3**

OBJECTIVES:
- ➢ To understand the representation and processing of Morphology and Part-of Speech Taggers.
- ➢ To appreciate various techniques used for speech synthesis and recognition and understand different aspects of natural language syntax and the various methods used for processing syntax.
- ➢ To understand different methods of disambiguating word sensesand various representations of semantics, discourse and applications of natural language processing

UNIT I: INTRODUCTION AND LINGUISTIC BACK GROUND   9 Hrs
Introduction to Natural Language Understanding – The Different levels of Language Analysis – Representation and Understanding – the Organization of Natural Language Understanding Systems.Linguistic Back ground: The elements of Simple Sentences – Adjective Phrases and Adverbial Phrases.

UNIT II: PARSING   9 Hrs
Top – Down Parser – A Bottom – Up Chart Parser – Transition Networks Grammars. Features and Augmented Grammars: Some basic Feature systems for English - Parsing with features -Efficient Parsing: Shift Reduce Parser – Deterministic Parser.

UNIT III   SEMANTICS   9 Hrs
Semantic and Logical Form – Encoding Ambiguity in the logical form – Thematic Roles.Semantic Interpretation and Compositionality – Lexicalized Semantic Interpretation and Semantic roles - semantic Interpretation Using Feature Unification .

UNIT IV   KNOWLEDGE REPRESENTATION   9 Hrs
A Representation Based on FOPC – Handling Natural Language Quantification . Local Discourse Context and Discourse Entities – Ellipses – Surface Anaphora – Establishing Coherence – Reference and Matching Expectations – Using Hierarchical Plans..

UNIT V   DISCOURSE STRUCTURE AND CASE STUDIES   9 Hrs
Need – Segmentation and Cue Phrases – Tense and aspect – Managing the Attentional Stack – an Example. Case Study : Logic and Model – Theoretic Semantics – A Semantics for FOPC – Symbolic Computation : Data structures – Matching , Search algorithms - The Unification Algorithm.

Total no.of Hours: 45

REFERENCE BOOKS
1. Ronald Hausser (1999) " *Foundations of Computational Linguistics*", Springer- Verlog,
2. Winograd , " *Language as a cognitive process- syntax*" , Addison Wesley
3. Popov (1986) , " *Talking with computer in Natural language*" springer verlog
4. Akshar Bharathi, Vineet Chaitanya, Rajeev Sangal (2000), "*Natural Language Processing* – A Paninian Perspective*", PHI
5. James Allen (2004)– "*Natural Language Understanding* ", Pearson Education

		L	T	P	C
MCS16CE08	PATTERN RECOGNITION	3	0	0	3

OBJECTIVES:
- ➢ To understand the concepts of Pattern recognition and machine learning.
- ➢ To appreciate supervised and unsupervised learning and their applications.
- ➢ To understand the theoretical and practical aspects of Probabilistic Graphical Models and concepts and algorithms of reinforcement learning and learn aspects of computational learning theory.

UNIT I: PATTERN RECOGNITION   **9 Hrs**
Overview of pattern recognition - Discriminant functions - Supervised learning - Parametric estimation -Maximum likelihood estimation - Bayesian parameter estimation - Perceptron algorithm - LMSE algorithm -Problems with Bayes approach - Pattern classification by distance functions - Minimum distance pattern classifier.

UNIT II: CLUSTERING AND CLASSIFICATION   **9 Hrs**
Clustering for unsupervised learning and classification - Clustering concept - C-means algorithm - Hierarchical clustering procedures - Graph theoretic approach to pattern clustering - Validity of clustering solutions.

UNIT III: STRUCTURAL PATTERN RECOGNITION   **9 Hrs**
Elements of formal grammars - String generation as pattern description - Recognition of syntactic description - Parsing - Stochastic grammars and applications - Graph based structural representation.

UNIT IV: FEATURE EXTRACTION AND SELECTION   **9 Hrs**
Entropy minimization - Karhunen - Loeve transformation - Feature selection through functions approximation - Binary feature selection - SVM.

UNIT V: RECENT ADVANCES   **9 Hrs**
Neural network structures for Pattern Recognition - Neural network based Pattern associates – Unsupervised learning in neural Pattern Recognition - Self organizing networks - Fuzzy logic - Fuzzy pattern classifiers - Pattern classification using Genetic Algorithms.

Total no.of Hours: 45

REFERENCES
1. Robert J.Schalkoff (1992), *Pattern Recognition : Statistical, Structural and Neural Approaches*, John Wiley & Sons Inc., New York
2. Tou and Gonzales (1974)*, Pattern Recognition Principles*, Wesley Publication Company, London
3. Duda R.O., and Hart.P.E (1973)., *Pattern Classification and Scene Analysis*, Wiley, New York
4. Morton Nadier and Eric Smith P. (1993) *Pattern Recognition Engineering*, John Wiley & Sons,
5.Sergios Theodoridis, Konstantinos Koutroumbas,(2009), Pattern Recognition, Fouth Edition

Dr.M.G.R.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

		L	**T**	**P**	**C**
MCS16CE09	**MULTI CORE PROGRAMMING**	**3**	**0**	**0**	**3**

OBJECTIVES:
- To understand the recent trends in the field of Computer Architecture and identify performance related parameters.
- To appreciate the need for parallel processing and problems related to multiprocessing.
- To understand the different types of multicore architectures and design of the memory hierarchy.
- To expose the students to multicore programming.

UNIT I: INTRODUCTION TO MULTIPROCESSORS AND SCALABILITY ISSUES 9 Hrs
Parallel computer models –- Symmetric and distributed shared memory architectures – Performance Issues. Multi-core Architectures - Software and hardware multithreading – SMT and CMP architectures – Design issues – Case studies – Intel Multi-core architecture – SUN CMP architecture – IBM cell processor.

UNIT II: PARALLEL PROGRAMMING 9 Hrs
Fundamental concepts – Designing for threads. Threading and parallel programming constructs – Synchronization – Critical sections – Deadlock. Threading APIs.

UNIT III: OPENMP PROGRAMMING 9 Hrs
OpenMP – Threading a loop – Thread overheads – Performance issues – Library functions. Solutions to parallel programming problems – Data races, deadlocks and livelocks – Non-blocking algorithms – Memory and cache related issues.

UNIT IV: MPI PROGRAMMING 9 Hrs
MPI Model – collective communication – data decomposition – communicators and topologies – point-to-point communication – MPI Library.

UNIT V: MULTITHREADED APPLICATION DEVELOPMENT 9 Hrs
Algorithms– program development – performance tuning – Case studies

Total no.of Hours:45

REFERENCES

1. Michael J Quinn (2003), ―*Parallel programming in C with MPI and OpenMP,* Tata McGraw Hill
2. Shameem Akhter and Jason Roberts (2006), ―*Multi-core Programming*, Intel Press
3. John L. Hennessey and David A. Patterson (2007), *Computer architecture – A quantitative approach*, (4th ed.), Morgan Kaufmann/Elsevier Publishers
4. David E. Culler, Jaswinder Pal Singh (2004), ―*Parallel computing architecture : A hardware software approach* , Morgan Kaufmann/Elsevier Publishers
5. Wesley Petersen and Peter Arbenz (2004), ―*Introduction to Parallel Computing*, Oxford University Press

	L	**T**	**P**	**C**
MCS16CE10 ADVANCED WIRELESS TECHNOLOGIES	**3**	**0**	**0**	**3**

OBJECTIVES:
- To learn various generations of wireless and cellular networks and fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.
- To study about Wi MAX networks, protocol stack and standards.

UNIT I: MOBILE NETWORK   **9 Hrs**
Introduction–Motivation–Scope– Nomenclature–GSM–GPRS and UMTS–Need of new architecture–Radio interfaces–Requirements for new architecture–Evolution of mobile network standardization

UNIT II 3G AND 4G CELLULAR NETWORKS   **9 Hrs**
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 3.9G a brief discussion –4G LAN and Cellular Networks

UNIT III: WIRELESS ARCHITECTURES   **9 Hrs**
E-UTRA- Physical–Radio Link Layer–RAN–MME Load Balancing–Tracking Concepts–IP packet Bearers–AAA, Security–EPS Mobility–Non-3GPP and 3GPP Architecture–Access and its Functions and procedures – Radio Access Network – CDMA 2000– I-WLAN Architecture

UNIT IV: VOICE OVER WIRELESS   **9 Hrs**
Circuit , Packet switched Mobile voice Telephony – SIP telephony over wired and wireless networks –Voice and related applications over IMS – Voice over DSL and cable with Femtocell – over the top(OTT) voice over IP alternatives

UNIT V: EVOLUTION OF MOBILE DEVICES AND OS   **9 Hrs**
Introduction – System architecture for voice-optimized devices – System architecture for multimedia devices – Mobile graphics acceleration – Multi mode, Multi frequency terminals, wireless notebook connectivity – smart phone OS.

Total no.of hrs: 45

REFERENCES:
1. Gottfried Punz (2010),” *Evolution of 3G Networks: The Concept, Architecture and Realization of Mobile Networks beyond UMTS*” ,Springer link
2. Clint Smith.P.E,Daniel Collins (2007),” *3G Wireless Networks*” TMH,Second Edition
3. Martin Sauter (2013), "3G,4G and Beyond Bringing Network Devices and web together, Wiley.
4. Mooi Choo Chuah, Qinqing Zhang (2008),”*Design and Performance of 3G Wireless Networks and Wireless LANs*”,Springer
5. Vijay .k. Garg (2002) ,”*Wireless Network Evolution: 2G To 3G*”, pearson Education

		L	**T**	**P**	**C**
MCS16CE11	**SERVICE ORIENTED ARCHITECTURE**	**3**	**0**	**0**	**3**

OBJECTIVES:
- To understand various architecture for application development.
- To learn the importance of SOA in application integration and web service and SOA related tools.

UNIT I : SOA AND WEB SERVICES FUNDAMENTALS   **9 Hrs**
Fundamentals of SOA-Common characteristics of contemporary SOA-common tangible benefits of SOA-Evolution of SOA-Evolution of SOA - web services and contemporary SOA-activity management and composition

UNIT II: SOA AND SERVICE ORIENTATION   **9 Hrs**
Principles of Service Orientation-Service orientation and the enterprise-anatomy of a service oriented architecture-common principles of service orientation-how service orientation principles inter relate-Service Layers

UNIT III: SOA PLANNING AND ANALYSIS   **9 Hrs**
SOA Delivery Strategies-Introduction to service oriented analysis-benefits of business centric SOA-Deriving Business services-service modeling –service modeling guidelines-classifying service model logic

UNIT IV: SOA DESIGN   **9 Hrs**
Introduction to service oriented design- WSDL language basics-SOAP language basics-service interface design tools-SOA composition guidelines-service design-Business process design

UNIT V: SOA PLATFORMS AND SOA SECURITY.   **9 Hrs**
SOA Platform basics-SOA support in J2EE-SOA support in .NET-SOA Security-SOA Governance
                                                                              Total no. of hrs: 45

REFERENCE BOOKS:
1. Shankar Kambhampaly (2008) *Service –Oriented Architecture for Enterprise Applications*, Wiley India
2. Eric Newcomer, Greg Lomow, *Understanding SOA with Web Services*, Pearson Education.
3. Mark O' Neill, et al. (2003), *Web Services Security*, Tata McGraw-Hill Edition
4. Thomas Erl (2005) *Service-Oriented Architecture: Concepts, Technology and Design*, Prentice Hall
5. Michael Rosen, Boris Lublinsky, (2008) *Applied SOA Service Oriented Architecture and Design Strategies*,Wiely India Edition

		L	**T**	**P**	**C**
MCS16IE09	**INTERNET SECURITY**	**3**	**0**	**0**	**3**

OBJECTIVES :
- Familiarize students with the Linux environment
- Learn the fundamentals of shell programming
- Acquire the basic knowledge of linux administration and security principles

UNIT I   SECURITY BUILDING BLOCKS   9Hrs
Users, Passwords and Authentication – Users, Groups and Super user – File System and Security - Physical Security for Servers.

UNIT II   NETWORK AND INTERNET SECURITY   9Hrs
Modems and Dial up Security – TCP/IP Networks – Securing TCP and UDP services – Network based authentication systems- Network file system.

UNIT III   SECURE OPERATIONS   9Hrs
Backups – Defending Accounts – Integrity Management – Auditing, Logging and Forensics .

UNIT IV   HANDLING SECURITY INCIDENTS   9Hrs
Discovering a break in – Protecting against program threats- denial of service attacks and solution.

UNIT V   SECURITY STRATEGY   9Hrs
Layered Linux Security Strategy - Managing Security Alerts and Updates – Building and maintaining a security Baseline – Testing and Reporting – Detecting and Responding to security breaches.

Total No of Hours: 45

REFERENCE BOOKS:
1. Simson Garfinkel, Gene Spafford PH.D. and Alan Schwartz PH.D (2003) Practical Unix and Internet Security, (3rd ed.)
2. Evi Nemeth, Garth Snyder, Trent R. Hein and Ben Whaley (2010) UNIX and Linux System Administration Handbook (4thed.)
3. David A. Curry (1992)UNIX System Security: A Guide for Users and System Administrators (AddisonWesley Professional Computing)
4. Michael Jang (2010)Security Strategies in Linux Platforms and Applications (Information Systems Security

		L	**T**	**P**	**C**
MCS16CE12	**AD-HOC AND WIRELESS SENSOR NETWORKS**	**3**	**0**	**0**	**3**

OBJECTIVES:
- ➤ To learn about the issues in the design of wireless ad hoc networks and working of protocols in different layers of mobile ad hoc and sensor networks.
- ➤ To expose the students to different aspects in sensor networks.
- ➤ To understand various security issues in ad hoc and sensor networks and solutions to the issues
- ➤ To study the various tools and simulators for Ad-hoc networks and Sensor networks

UNIT I: AD HOC NETWORKS: **9 Hrs**
Wireless Evolutions – Ad-hoc network characteristics - Ad hoc Network Applications – VANETs - Design Challenges - Performance of collision avoidance protocols - Framework and Mechanisms for Fair Access in IEEE 802.11.

UNIT II: ROUTING AND TRANSPORT LAYER IN AD HOC NETWORKS: **9 Hrs**
Routing in Mobile Ad hoc Networks – Flooding - Proactive Routing - On-demand Routing - Location-based Routing - - Classifications of Multicasting Protocols - Multicasting Protocols - Transport layer Protocols - TCP and Ad-hoc Networks - Modified TCP - TCP-aware Cross-layered Solutions - Ad-hoc Transport Protocol

UNIT-III: WIRELESS SENSOR NETWORKS I: **9 Hrs**
Introduction and Overview of Wireless Sensor Networks Applications of Wireless Sensor Networks - Basic Wireless Sensor Technology - Medium Access Control Protocols for Wireless Sensor Networks - IEEE 802.15.4 LR-WPANs Standard Case Study

UNIT-IV: WIRELESS SENSOR NETWORKS II: **9 Hrs**
Routing Protocols for Wireless Sensor Networks Routing Challenges and Design Issues in WSN - Routing Strategies in WSN - Transport Control Protocols- Transport Protocol Design Issues   - Examples of Existing Transport Control Protocols - Performance of Transport Control Protocols - Network Management - Network Management Design Issues - Example of Management Architecture: MANNA

UNIT-V: TOOLS AND SIMULATORS   **9 Hrs**
GloMoSim – Network Simulators(NS2)   – J-Sim – VANET simulators – Simulation of Urban Mobility(SUMO)

                                       Total no. of hrs: 45

REFERENCE BOOKS:
1. Prasant Mohapatra and Srihanamurthy, "*Ad Hoc Networks Technologies and Protocols*", Springer, Springer International Edition, 2009.
2. Kazem Sohraby, Daniel Minoli, Taieb Znati, (2007) "*Wireless Sensor Networks*", A John Wiley & Sons, Inc., Pub!ication
3. Carlos De Morais Cordeiro, Dharma Prakash Agrawal (2011),"*Ad Hoc and Sensor Networks: Theory and Applications*", (2nd ed.) World Scientific
4. Houda Labiod (2010),"*Wireless Ad Hoc and Sensor Networks*", John Wiley & Sons

	L	T	P	C

MCS16CE13   SOCIAL NETWORK ANALYSIS   3   0   0   3

OBJECTIVES:
- ➢ To gain knowledge about the current Web development and emergence of Social Web.
- ➢ To study about the modeling, aggregating and knowledge representation of Semantic Web.
- ➢ To learn about the extraction and mining tools for Social networks.
- ➢ To gain knowledge on Web personalization and Web Visualization of Social networks.

UNIT I   INTRODUCTION TO SOCIAL NETWORK ANALYSIS   9 Hrs
Emergence of the Social Web - Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis - Electronic discussion networks, Blogs and online communities, Web-based networks - Applications of Social Network Analysis.

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE
**   REPRESENTATION   9 Hrs**
Ontology and their role in the Semantic Web - Ontology-based Knowledge Representation – Ontology languages for the Semantic Web – RDF and OWL - Modelling and aggregating social network data - State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced Representations.

UNIT III EXTRACTION AND MINING COMMUNITITES
**   IN WEB SOCIAL NETWROKS   9 Hrs**
Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks - Definition of Community - Evaluating Communities - Methods for Community Detection & Mining - Applications of Community Mining Algorithms - Tools for Detecting Communities Social Network Infrastructures and Communities - Decentralized Online Social Networks- MultiRelational Characterization of Dynamic Social Network Communities.

UNIT IV PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES   9 Hrs
Understanding and Predicting Human Behaviour for Social Communities - User Data Management, Inference and Distribution - Enabling New Human Experiences - Reality Mining - Context-Awareness - Privacy in Online Social Networks - Trust in Online Environment - Trust Models Based on Subjective Logic - Trust Network Analysis - Trust Transitivity Analysis - Combining Trust and Reputation – Trust Derivation Based on Trust Comparisons - Attack Spectrum and Countermeasures.

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS   9 Hrs
Graph Theory- Centrality- Clustering - Node-Edge Diagrams, Matrix representation, Visualizing Online Social Networks, Visualizing Social Networks with Matrix-Based Representations- Matrix - Node-Link Diagrams, Hybrid Representations - Applications - Covert Networks - Community Welfare - Collaboration Networks - Co-Citation Networks.

Total no. of hrs: 45

REFERENCES:
1. Peter Mika, "Social networks and the Semantic Web", Springer, 1 st edition 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1 st edition, 2010.
3.Guandong Xu , Yanchun Zhang and Lin Li, "Web Mining and Social Networking Techniques and applications", Springer, 1st edition, 2011.
4. Dion Goh and Schubert Foo, "Social information retrieval systems: emerging technologies and applications for searching the Web effectively", IGI Global snippet, 2008.
5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and social information retrieval and access: techniques for improved user modelling", IGI Global snippet, 2009.
6. John G. Breslin, Alexandre Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009

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(Decl. U/S 3 of the UGC Act 1956)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

			L	**T**	**P**	**C**
MCS16CE14	**PRINCIPLES OF SECURE CODING**		**3**	**0**	**0**	**3**

OBJECTIVES:
- ➤ To learn about the need for secure system.
- ➤ To understand the issues in secure coding techniques.
- ➤ To understand the socket security.

UNIT I   INTRODUCTION: 9Hrs

The Need for Secure Systems: Applications on the Wild Wild Web, The Need for Trustworthy Computing, the Proactive Security Development Process: Process Improvements, The Role of Education, Design Phase , Development Phase, Test Phase , Security Principles to Live By: SD3: Secure by Design, by Default, and in Deployment, Security Principles, Threat Modelling: Secure Design Through Threat Modelling, Security Techniques.

UNIT II   CODING TECHNIQUES: 9Hrs

The Buffer Overrun: Stack Overruns, Heap Overruns ,Array Indexing Errors, Format String Bugs, Preventing Buffer Overruns, Determining Appropriate Access Control : Why ACLs Are Important, Creating ACLs, NULL DACLs and Other Dangerous ACE Types Cryptographic Foibles: Using Poor Random Numbers, Using Passwords to Derive Cryptographic Keys, Key Management Issues, Using the Same Stream-Cipher Encryption Key, Bit-Flipping Attacks Against Stream Ciphers, Reusing a Buffer for Plaintext and Cipher text , Using Crypto to Mitigate Threats.

UNIT III   DATABASE AND WEB SPECIFIC INPUT ISSUES: 9Hrs

Protecting Secret Data : Attacking Secret Data, Managing Secrets in Memory, Locking Memory to Prevent Paging Sensitive Data ,Protecting Secret Data in Managed Code, Raising the Security Bar, Database Input Issues: The Issue , Pseudoremedy #1: Quoting the Input , Pseudoremedy #2: Use Stored Procedures , Remedy #1: Never Ever Connect as sysadmin, Remedy #2: Building SQL Statements Securely ,Web-Specific Input Issues: Other XSS-Related Attacks, XSS Remedies.

UNIT IV   SOCKET SECURITY: 9Hrs

Socket Security: Avoiding Server Hijacking, TCP Window Attacks, Choosing Server Interfaces, Accepting Connections, Writing Firewall-Friendly Applications, Spoofing and Host-Based and Port-Based Trust, Securing RPC, ActiveX Controls, and DCOM: An RPC Primer, Secure RPC Best Practices, Secure DCOM Best Practices, Protecting against Denial of Service Attacks: Application Failure Attacks, CPU Starvation Attacks, Memory Starvation Attacks, Resource Starvation Attacks, Network Bandwidth Attacks

UNIT V   SECURITY TESTING AND DOCUMENTATON: 9Hrs

Security Testing: The Role of the Security Tester, Building Security Test Plans from a Threat Model, Testing Clients with Rogue Servers , Testing with Security Templates, Determining Attack Surface, Secure Software Installation: Using the Security Configuration Editor, Low-Level Security APIs, Using the Windows Installer, Building Privacy into Your Application: Major Privacy Legislation, Privacy vs. Security, Building a Privacy Infrastructure, Designing Privacy-Aware Applications, Writing Security Documentation and Error Messages: Security Issues in Documentation, Security Issues in Error Messages, A Tyspical Security Message, Information Disclosure Issues

Total No of Hours: 45

REFERENCES
1. Michael Howard , David LeBlanc, "Writing Secure Code", Microsoft Press,2nd Edition, 2003.
2. Robert C.Seacord, " Secure Coding in C and C++", Pearson Education, 2ndedition, 2013.
3. Julia H. Allen, Sean J. Barnum, Robert J. Ellison, Gary McGraw, Nancy R.Mead, " Software Security Engineering : A guide for Project Managers",Addison-Wesley Professional, 2008.

	L	T	P	C

MCS16CC005   DATA CLOUD AND STORAGE   3   0   0   3
TECHNOLOGY

OBJECTIVES:
- ➢ To learn about the different issues and challenges in cloud storage.
- ➢ To understand the issues in infrastructure resource management.
- ➢ To understand the security, metrics and storage services.

UNIT – I: ISSUES AND CHALLENGES   **9 Hrs**
Industry Trends and perspectives - Importance of data and storage - IT challenges - IT opportunities- cloud opportunities - cloud virtualization - storage networking - server and storage I/O fundamentals - storage services - storage access.

UNIT – II: INFRASTRUCTURE RESOURCE MANAGEMENT   **9 Hrs**
Data infrastructure-Infrastructure resource management-understanding and managing IT resource-situational awareness-search and discovery-capacity planning-data movement and migration.

UNIT – III: SECURITY   **9 Hrs**
Data and Storage networking security-Security threats and challenges-securing networks-storage-clouds-checklist-data protection- RAS-backup/restore-business continuance-disaster recovery-SLO/SLA-data protection checklist.

UNIT – IV: METRICS   **9 Hrs**
Measurements for situational awareness-Metrics-performance indicators-data foot print reduction-focus-DFR techniques-tools-compression and compaction-data de-duplication-space saving snapshots.

UNIT – V: STORAGE SERVICES   **9 Hrs**
Storage services and systems – functionalities – architectures - storage virtualization - Server virtualization – connectivity - cloud solution packages-server virtualization.

Total no.of Hrs: 45

REFERENCES:
1. Greg Schulz, Cloud and Virtual Data Storage Networking, Auerbach Publications, 2011.[ISBN: 978-1439851739].
2. Marty Poniatowski, Foundations of Green IT,1 st edition,2009. [ISBN: 978-0137043750].
3. EMC2, Information Storage and Management EMC Corporation, 2009. [ISBN: 978-0470294215]
4. Volker Herminghaus, Albrecht Scriba,, Storage Management in Data Centers, Springer Publisher , 2009. [ISBN: 978-3540850229],
5. Klaus Schmidt, High Availability and Disaster Recovery, Springer 2006. [ISBN: 978-3540244608]

	L	T	P	C

MCS16CE15   HIGH SPEED NETWORKS & SECURITY   3   0   0   3

OBJECTIVES:
- To learn about the different internet routing protocols and different aspects routing in.
- To understand the issues in ATM networks and the protocols used for th working of ATM networks and how TCP play the role in Network Congestion.
- To understand the mathematical model for security and different aspects of encryption techniques and the role played by authentication in security.

UNIT I: INTRODUCTION   9 Hrs
Networking history – Need for speed and quality of services – Advanced TCP and ATM networks – Need for the protocol architecture – TCP/IP protocol architecture – OSI model – Internetworking – Transmission control protocol – User datagram protocol – Internet protocol – IPv6.

UNIT II: ADVANCED NETWORKS   9 Hrs
Packet switching networks – Frame relay networks – ATM protocol architecture – ATM logical connections – ATM cell – ATM service categories – ATM adoption layer – The emergency of high speed LANs-Ethernet – Fiber channel – Wireless LANs.

UNIT III: CONGESTION AND TRAFFIC MANAGEMENT   9 Hrs
Effect of congestion – Congestion and control – Traffic management – Congestion control in packet switching networks – Frame relay congestion control – Need for Flow and error control - Link control mechanisms – ARQ performance – TCP flow control – TCP congestion control – Performance of TCP over ATM – Requirement for ATM traffic and congestion control – ATM traffic Related attributes – Traffic management framework – Traffic control – ABR traffic management – GFR traffic management.

UNIT IV: PUBLIC KEY ENCRYPTION   9 Hrs
Attacks - Services - Mechanisms - Conventional Encryption - Classical and Modern Techniques – Encryption Algorithms – Confidentiality - RSA - Elliptic Curve Cryptography - Number Theory Concepts

UNIT V: MESSAGE AUTHENTICATION   9 Hrs
Hash Functions – SHA algorithm – Digest Functions – MD 5algorithm – Digital Signatures – Secured Electronic Transaction – Authentication protocols.

Total no.of Hours: 45

REFERENCE:
1. William Stallings (2002), "*High speed Networks and Internets*", (2nd ed.), Pearson Education
2. Halsall, "*Data Communications Computer Networks and Open Systems*", Pearson Education
3. Wolf Gary Effelsberg, Otto Spaniol, Andre D. (1996), "*High Speed Networking for Multimedia applications*", Kluwer Academic publishers
4. Andrew S.Tanenbaum (1996), "*Computer Networks*", (3rd ed.), Prentice Hall
5. Stallings (1999), *Cyptography & Network Security - Principles & Practice*, Pearson Education
6. Bruce, Schneier (1996), *Applied Cryptography* (2nd ed.), Toha Wiley & Sons

	L	**T**	**P**	**C**
MCS16CE16 **VIRTUALISATION TECHNOLOGIES**	3	0	0	3

OBJECTIVES:
- To understand the need of virtualization
- To explore the types of virtualization
- To understand the concepts of virtualization and virtual machines
- To understand the practical virtualization solutions and enterprise solutions
- To understand the concepts of cloud computing
- To have an introduction to cloud programming giving emphasis to Hadoop MapReduce
- To understand the security issues in cloud computing

UNIT I OVERVIEW OF VIRTUALIZATION 9 Hrs

Basics of Virtualization – Types of Virtualization Techniques – Merits and demerits of Virtualization – Full Vs Para-virtualization – Virtual Machine Monitor/Hypervisor - Virtual Machine Basics – Taxonomy of Virtual machines – Process Vs System Virtual Machines – Emulation: Interpretation and Binary Translation - HLL Virtual Machines

UNIT II SERVER AND NETWORK VIRTUALIZATION 9 Hrs

Server Virtualization: Virtual Hardware Overview - Server Consolidation – Partitioning Techniques - Uses of Virtual server Consolidation – Server Virtualization Platforms, Network Virtualization: Design of Scalable Enterprise Networks – Layer2 Virtualization – VLAN - VFI - Layer 3 Virtualization – VRF - Virtual Firewall Contexts - Network Device Virtualization - Data- Path Virtualization – Routing Protocols

UNIT III STORAGE, DESKTOP AND APPLICATION VIRTUALIZATION 9 Hrs

Storage Virtualization: Hardware Devices – SAN backup and recovery techniques – RAID – Classical Storage Model – SNIA Shared Storage Model – Virtual Storage: File System Level and Block Level, Desktop Virtualization: Concepts - Desktop Management Issues - Potential Desktop Virtualization Scenarios - Desktop Virtualization Infrastructures, Application Virtualization: Concepts - Application Management Issues - Redesign Application Management – Application Migration

UNIT IV APPLYING VIRTUALIZATION 9 Hrs

Practical Virtualization Solutions: Comparison of Virtualization Technologies: Guest OS/ Host OS – Hypervisor – Emulation – Kernel Level – Shared Kernel, Enterprise Solutions: VMWare Server – VMWare ESXi – Citrix Xen Server – Microsoft Virtual PC – Microsoft Hyper-V – Virtual Box, Server Virtualization: Configuring Servers with Virtualization – Adjusting and Tuning Virtual servers – VM Backup – VM Migration, Desktop Virtualization: Terminal services – Hosted Desktop – Web-based Solutions – Localized Virtual Desktops, Network and Storage Virtualization: Virtual Private Networks – Virtual LAN – SAN and VSAN – NAS

UNIT V CLOUD COMPUTING 9 Hrs

Cloud Computing Basics - Cloud Computing Definition – Evolution of Clod Computing - General Cloud Environments – Cloud Services – Service Providers – Google – Amazon – Microsoft – IBM – EMC – NetApp – Sales force – Tools for building private cloud - Open Issues in Cloud Computing – Cloud security challenges, Cloud Programming: Hadoop – Map Reduce – HDFS – Hadoop I/O – Developing a MapReduce Application

Total no.of Hours: 45

REFERENCES:
1. James E. Smith, Ravi Nair, Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann, 2005.
2. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach Publications, 2006.
3. Kumar Reddy, Victor Moreno, Network virtualization, Cisco Press, July, 2006.
4. Chris Wolf, Erick M. Halter, -Virtualization: From the Desktop to the Enterprise, APress 2005.
5. Danielle Ruest, Nelson Ruest -Virtualization: A Beginner‟ s Guide, TMH, 2009

6. Kenneth Hess , Amy Newman: Practical Virtualization Solutions: Virtualization from the Trenches Prentice Hall 2010

7. John Rittinghouse, James Ransome, Cloud Computing, Implementation, Management and Strategy, CRC Press, 2010

8. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter Cloud Computing: A Practical Approach, TMH, 2010

9. Lee Badger , Tim Grance , Robert Patt -Corner , Jeff Voas Cloud Computing Synopsis and Recommendations NIST, May 2011

10. Tom White -Hadoop: The Definitive Guide Storage and Analysis at Internet Scale O'Reilly Media Press May 2012

11. Dave Shackleford -Virtualization security-Protecting Virtualized Environments, Sybex Publishers, First Edition, 2012

			L	T	P	C
MCS16CE17	**RESEARCH METHODOLOGY**		3	0	0	3

OBJECTIVES:
- ➢ To understand the need of research
- ➢ To explore the types of research design
- ➢ To understand the concepts of data collections for the research
- ➢ To understand the practical issues in reporting and thesis writing

UNIT-I - OBJECTIVES AND TYPES OF RESEARCH   **9 Hrs**
Definition , Motivation and objectives – Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.

UNIT-II - RESEARCH FORMULATION   **9 Hrs**
Defining and formulating the research problem -
Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis.

UNIT-III - RESEARCH DESIGN AND METHODS   **9 Hrs**
Research design – Basic Principles- Need of research design — Features of good design – Important concepts relating to research design – Observation and Facts, Laws and Theories, Prediction and explanation, Induction, Deduction, Development of Models. Developing a research plan - Exploration, Description, Diagnosis, Experimentation. Determining experimental and sample designs.

UNIT-IV - DATA COLLECTION AND QUANTITATIVE METHODS FOR PROBLEM SOLVING   **9 Hrs**
Observation and Collection of data - Methods of data collection – Sampling Methods- Online Databases , Statistical Modeling, Analysis and Inference, Time Series Analysis, Probability Distributions, Multivariate methods, Concepts of Correlation and Regression, Spectral Analysis, Error Analysis, Hypothesis-testing - Generalization and Interpretation.

UNIT-V - REPORTING AND THESIS WRITING   **9 Hrs**
Structure and components of scientific reports - Types of report – Technical reports and thesis – Significance – Different steps in the preparation – Layout, structure and Language of typical reports – Illustrations and tables - Bibliography, referencing and footnotes - Oral presentation – Planning – Preparation – Practice – Making presentation , Reproduction of published material – Plagiarism - Citation and acknowledgement - Reproducibility and accountability.

             Total no.of Hours: 45

REFERENCES
1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.
3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes.
4. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.

	L	**T**	**P**	**C**
MCS16CE18 CRYPTOGRAPHY AND NETWORK SECURITY	3	0	0	3

OBJECTIVES:
- ➢ To understand the conventional encryption and public key encryption
- ➢ To explore the IP and Web security
- ➢ To understand the concepts System security

UNIT -I: CONVENTIONAL ENCRYPTION TECHNIQUES   **9 Hrs**
Conventional encryption model – Stenography – Data Encryption Standard – block cipher –
Encryption algorithms – confidentiality – Key distribution

UNIT -II: PUBLIC KEY ENCRYPTION AND HASHING   **9 Hrs**
Principles of public key cryptosystems –   RSA algorithm – Diffie- Hellman Key Exchange – Elliptic
curve cryptography – message authentication and Hash functions – Hash and MAC algorithms –
Digital signatures

UNIT -III: IP SECURITY   **9 Hrs**
IP Security Overview – IP security Architecture – authentication Header – Security payload – security
associations – Key Management

UNIT -IV: WEB SECURITY   **9 Hrs**
Web security requirement – secure sockets layer and transport layer security – secure electronic
transaction – digital signature

UNIT -V: SYSTEM SECURITY   **9 Hrs**
Intruders – Viruses – Worms – firewall design – trusted systems – antivirus techniques – digital
Immune systems

                                                                     Total no.of Hrs: 45

REFERENCES:
1. William Stallings, "Cryptography and Network security", 6/e, PHI publications, 2013
2. Behrouz A. Forouzan,"Cryptography and Network Security "TMH, 2008.
3. AtulKahate," Cryptography And Network Security", TMH, 2008