Estd. 1995

SETHU INSTITUTE OF TECHNOLOGY
(An Autonomous Institution)

Pulloor, Kariapatti – 626 115

ISO 9001:2008
FS 70973

M.E. COMPUTER SCIENCE & ENGINEERING

REGULATION 2015

CHOICE BASED CREDIT SYSTEM

CURRICULUM & SYLLABUS

(1st SEMESTER To 4th SEMESTER)

Approved in the Academic Council Meeting held on 21.07.2017

Chairperson

Chairperson
Board of Studies
Computer Science & Engineering
Sethu Institute of Technology
Kariapatti - 626 115

CHAIRMAN

ACADEMIC COUNCIL

CHAIRMAN
ACADEMIC COUNCIL
Sethu Institute of Technology
Pulloor, Kariapatti - 625 115

SETHU INSTITUTE OF TECHNOLOGY

Pulloor, Kariapatti – 626 115

M.E. Degree Programme

CURRICULUM & SYLLABUS

Regulations 2015

(Applicable to the students admitted from the Academic Year 2015-2016 onwards)

Master of Engineering in COMPUTER SCIENCE AND ENGINEERING

OVERALL COURSE STRUCTURE

Category	Total No. of Courses	Credits	Percentage
Basic Science	**1**	**4**	**5.71**
Programme-CORE	**11**	**30**	**42.85**
Programme- ELECTIVE	**5**	**15**	**21.43**
Open Elective	**1**	**3**	**4.3**
Project Work	**2**	**18**	**25.71**
TOTAL	**22**	**70**	**100**

Course Credits – Semester wise

Branch	I	II	III	IV	V	VI	VII	VIII	TOTAL
M.E.-CSE	**18**	**18**	**19**	**15**	**-**	**-**	**-**	**-**	**70**

Master of Engineering in Computer Science and Engineering
REGULATION – 2015

(Applicable to the students admitted from the Academic Year 2015 – 2016 onwards)

CURRICULUM

PROGRAMME CORE

WINTER SEMESTER

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C	OFFERED DURING SUMMER OR WINTER	Category
1.	15PMA121	Advanced Mathematics for Computing	3	1	0	4	Winter	BS
2.	15PCS101	Analysis of Algorithms and Data Structures	3	0	0	3	Winter	PC
3.	15PCS102	Machine Learning Techniques	3	0	0	3	Winter	PC
4.	15PCS103	Advanced Operating Systems	3	0	0	3	Winter	PC
5.	15PCS104	Advanced Data Structures Laboratory	0	0	3	2	Winter	PC
6.	15PCS303/ 15PNE301	Mobile and Pervasive Computing	4	0	0	4	Winter	PC
7.	15PCS301	Multicore Architecture	3	0	0	3	Winter	PC
8.	15PCS302	Project Phase I	0	0	6	3	Winter	PC
SUMMER SEMESTER								
9.	15PCS201	Data Science and Big Data Analytics	3	0	0	3	Summer	PC
10.	15PCS205/ 15PNE203	Network Security	3	0	0	3	Summer	PC
11.	15PCS202	Internals of Android	3	0	0	3	Summer	PC
12.	15PCS203	Cloud Infrastructure Laboratory	0	0	3	2	Summer	PC
13.	15PCS204	Industrial Training and Internship	0	0	2	1	Summer	PC
14.	15PCS401	Project Work Phase II	0	0	30	15	Summer	PC

ELECTIVES

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	15PCS501	Software Requirements Engineering	3	0	0	3
2.	15PCS502	Software Architectures and design	3	0	0	3
3.	15PCS503	Software Quality Assurance	3	0	0	3
4.	15PCS504	Open Source Systems and Networking	3	0	0	3
5.	15PCS505	Compiler Optimization Techniques	3	0	0	3
6.	15PCS506	Information Storage Techniques	3	0	0	3
7.	15PCS507	Energy Aware Computing	3	0	0	3
8.	15PCS508	Web Data Mining	3	0	0	3
9.	15PCS509	Mobile Applications Development	3	0	0	3
10.	15PCS510	Information Retrieval Techniques	3	0	0	3
11.	15PCS511	Robotics	3	0	0	3
12.	15PCS512	Web Services	3	0	0	3
13.	15PCS513	Image Processing and Analysis	3	0	0	3
14.	15PCS514	Managing Big Data	3	0	0	3
15.	15PCS515	Enterprise Application Integration	3	0	0	3
16.	15PCS516	4G Mobile Technologies	3	0	0	3
17.	15PCS517	Cloud Application Development	3	0	0	3
18.	15PCS524/ 15PNE502	Video Analytics	3	0	0	3
19.	15PCS525/ 15PNE512	Network Protocols	3	0	0	3
20.	15PCS526/ 15PNE514	Social Network Analysis	3	0	0	3
21.	15PCS527/ 15PNE517	Information Security	3	0	0	3
22.	15PCS528/ 15PNE518	TCP/IP Design and Implementation	3	0	0	3
23.	15PCS529/ 15PNE521	Next Generation Networks	3	0	0	3

OPEN ELECTIVES

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	15PSE601	Research Methodology	3	0	0	3
2.	15PEN602	Pedagogy for Engineering Education	3	0	0	3
3.	15PEN603	Professional and Communication Skill	2	0	2	3
4.	15PPE604	Soft Computing	3	0	0	3
5.	15PCD605	Industrial Safety	3	0	0	3
6.	15PCD606	Business Management and Leadership	3	0	0	3
7.	15PCS607	Management Information Systems	3	0	0	3

ELECTIVES FOR Ph.D. CANDIDATES

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	15PCS518	Protocols and Architectures for Wireless Sensor Networks	3	0	0	3
2.	15PCS519	Language Technologies	3	0	0	3
3.	15PCS520	Multi objective Optimization Techniques	3	0	0	3
4.	15PCS521	Machine Learning	3	0	0	3
5.	15PCS522	Data Mining Techniques	3	0	0	3
6.	15PCS523	Industrial and Systems Engineering in Healthcare	3	0	0	3

SEMESTER I

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	15PMA121	Advanced Mathematics for Computing	3	2	0	4
2.	15PCS101	Analysis of Algorithms and Data Structures	3	0	0	3
3.	15PCS102	Machine Learning Techniques	3	0	0	3
4.	15PCS103	Advanced Operating Systems	3	0	0	3
5.		Elective I	3	0	0	3
PRACTICAL						
6.	15PCS104	Advanced Data Structures Laboratory	0	0	3	2
Total			15	2	3	18
Total Number of Credits: 18						

SEMESTER II

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	15PCS201	Data Science and Big Data Analytics	3	0	0	3
2.	15PCS205/ 15PNE203	Network Security	3	0	0	3
3.	15PCS202	Internals of Android	3	0	0	3
4.		Elective II	3	0	0	3
5.		Elective III	3	0	0	3
PRACTICAL						
6.	15PCS203	Cloud Infrastructure Laboratory	0	0	3	2
7.	15PCS204	Industrial Training and Internship	0	0	2	1
Total			15	0	5	18
Total Number of Credits: 18						

SEMESTER III

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	15PCS303/ 15PNE301	Mobile and Pervasive Computing	4	0	0	4
2.	15PCS301	Multicore Architecture	3	0	0	3
3.		Elective IV	3	0	0	3
4.		Elective V	3	0	0	3
5.		Open Elective	3	0	0	3
PRACTICAL						
6.	15PCS302	Project Work Phase I	0	0	6	3
Total			16	0	6	19
Total Number of Credits: 19						

SEMESTER IV

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1.	15PCS401	Project Work Phase II	0	0	30	15
Total			0	0	30	15
Total Number of Credits: 15						

TOTAL NO. OF CREDITS: 18+18+19+15=70

SETHU INSTITUTE OF TECHNOLOGY

Pulloor, Kariapatti – 626 115

M.E. Degree Programme (Part Time)

CURRICULUM

Regulations 2015

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Master of Engineering in COMPUTER SCIENCE AND ENGINEERING

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Open Elective	**1**	**3**	**4.3**
Project Work	**2**	**18**	**25.71**
TOTAL	**20**	**70**	**100**

Course Credits – Semester wise

Branch	I	II	III	IV	V	VI	TOTAL
M.E.-CSE (Part Time)	**12**	**11**	**9**	**10**	**13**	**15**	**70**

SEMESTER I

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	15PMA121	Advanced Mathematics for Computing	3	2	0	4
2.	15PCS101	Analysis of Algorithm and Data Structures	3	0	0	3
3.		Elective I	3	0	0	3
4.	15PCS104	Advanced Data Structures Laboratory	0	0	3	2
Total			9	2	3	12
Total Number of Credits: 12						

SEMESTER II

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	15PCS201	Data Science and Big Data Analytics	3	0	0	3
2.	15PCS205/ 15PNE203	Network Security	3	0	0	3
3.		Elective II	3	0	0	3
PRACTICAL						
4.	15PCS203	Cloud Infrastructure Laboratory	0	0	3	2
Total			9	0	3	11
Total Number of Credits: 11						

SEMESTER III

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	15PCS102	Machine Learning Techniques	3	0	0	3
2.	15PCS103	Advanced Operating Systems	3	0	0	3
3.		Elective III	3	0	0	3
PRACTICAL						
Total			9	0	0	9
Total Number of Credits: 9						

SEMESTER IV

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	15PCS202	Internals of Android	3	0	0	3
2.		Elective IV	3	0	0	3
3.		Elective V	3	0	0	3
PRACTICAL						
4.	15PCS204	Industrial Training/Internship	0	0	2	1
Total			9	0	2	10
Total Number of Credits: 10						

SEMESTER V

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	15PCS303/ 15PNE301	Mobile and Pervasive Computing	4	0	0	4
2.	15PCS301	Multicore Architecture	3	0	0	3
3.		Open Elective	3	0	0	3
PRACTICAL						
4.	15PCS302	Project Work Phase I	0	0	6	3
Total			10	0	6	13
Total Number of Credits: 13						

SEMESTER VI

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICAL						
1.	15PCS401	Project Work phase II	0	0	30	15
Total			0	0	30	15
Total Number of Credits: 15						

TOTAL NO. OF CREDITS: 70

15PMA121	ADVANCED MATHEMATICS FOR COMPUTING (M.E. CSE)	L	T	P	C
		3	2	0	4

OBJECTIVES :

- To develop an understanding of the concepts of Graph Theory.
- To familiarize the student with various methods in hypothesis testing.
- To make the student acquire sound knowledge in Estimation Theory.

UNIT I TESTING OF HYPOTHESIS 9 + 6

Sampling distributions - Estimation of parameters - Statistical hypothesis - Tests based on Normal, t, Chi-square and F distributions for mean, variance and proportion.

UNIT II ESTIMATION THEORY 9 + 6

Unbiased Estimators – Method of Moments – Maximum Likelihood Estimation - Curve fitting by Principle of Least squares – Regression Lines.

UNIT III LINEAR PROGRAMMING TECHNIQUES 9 + 6

Simplex method – Two phase method – Transportation problem – North west, Least cost, Vogel's approximation, Modi method – Assignment problem.

UNIT IV SIMULATION MODELLING 9 + 6

Discrete Even Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to Queuing systems.

UNIT V GRAPH THEORY 9 + 6

Introduction to Graphs - Graph operations- Graphs and Matrices – Graph Isomorphism – Connected Graphs – Euler Graphs – Hamiltonian paths and circuits - Shortest path problem – max-flow min-cut problems (Basic definitions and examples only).

TOTAL : 45 (L) + 30 (T) = 75 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Apply the acquired knowledge of Graph Theory which is useful to design various computer networks.
- Study the concepts of Estimation theory and analyze the security of networks.
- Apply the various techniques of hypothesis testing which are applied in the field of data analysis.
- Apply the simulation techniques in solving real life problem like inventory control, queuing theory, communication networks etc.
- Identify the basic properties of graphs, trees and use these concepts to model simple applications.

REFERENCE BOOKS:

1. DOUGLAS B WEST, “Introduction to Graph Theory”, Prentice Hall of India, New Delhi, 2nd Edition, (2003).
2. CHARTRAND G. and ZHANG P., “Introduction to Graph Theory”, McGraw-Hill, New Delhi, 1st Edition, (2004).
3. JAY L DEVORE, “Probability and Statistics for Engineering and the Sciences”, Thomson and Duxbury, Massachusetts, 6th Edition, (2002).
4. RICHARD JOHNSON, “Miller & Freund’s Probability and Statistics for Engineer”, Prentice Hall of India, New Delhi, 7th Edition, (2007).
5. WINSTON.W.L. “Operations Research”, Thomson – Brooks/Cole, California, 4th Edition, (2003).
6. GUPTA S.C. AND KAPOOR V.K.”Fundamentals of Mathematical Statistics”, Sultan and Sons, New Delhi, 11th Edition, (2001).

15PCS101 ANALYSIS OF ALGORITHMS AND DATA STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVES :

- To explain the fundamentals of algorithm analysis.
- To provide an understanding on various heap and search structures.
- To impart knowledge in geometric and parallel algorithms.

UNIT I FUNDAMENTALS **9**

Introduction-Notion of Algorithm-Fundamentals of Algorithmic Solving -Fundamentals of the Analysis Framework-Asymptotic Notations and Basic Efficiency Classes. Mathematical Analysis of Non-Recursive Algorithm-Mathematical Analysis of Recursive Algorithm-Recurrence Equations – Solving Recurrence Equations-Introduction to NP-Completeness/NP-Hard

UNIT II HEAP STRUCTURES **9**

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

UNIT III SEARCH STRUCTURES **9**

Binary Search Trees – AVL Trees – Red-Black trees – B-Trees – 2-3 Trees -2-3-4 Tress-Splay Trees – Tries.

UNIT IV GEOMETRIC ALGORITHMS **9**

Segment Trees – 1-Dimensional Range Searching -k-d Trees – Line Segment Intersection – Convex Hulls -Computing the Overlay of Two Subdivisions -Range Trees -Voronoi Diagram.

UNIT V PARALLEL ALGORITHMS **9**

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

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Analyze the efficiency of an algorithm. (Analyze)
- Explain various heap structures. (Understand)
- Describe various geometric and parallel algorithms.(Remember)
- Apply a search structure for the given set of data.(Apply)
- Discuss different tree and sorting techniques. (Understand)

REFERENCES:

1. E. Horowitz, S. Sahni and Dinesh Mehta, “Fundamentals of Data structures inC++”, University Press, 2007.
2. G. Brassard and P. Bratley, “Algorithmics:Theory and Practice”, Prentice –Hall,1988.
3. Mark de Berg, Otfried Cheong, Marc van Kreveld, Mark Overmars, ”Computational Geometry Algorithms and Applications”,Third Edition, 2008
4. James A. Storer, ”An Introduction to DataStructures and Algorithms”, Springer, New York, 2002.
5. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Al”, 2009

15PCS102	MACHINE LEARNING TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce linear and non-linear learning models
- To give an idea about distance-based clustering techniques and to build tree and rule based models
- To outline reinforcement learning techniques

UNIT I FOUNDATIONS OF LEARNING 9

Components of learning – learning models – geometric models – probabilistic models – logic models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound – approximation-generalization tradeoff – bias and variance – learning curve.

UNIT II LINEAR MODELS 9

Linear classification – univariate linear regression – multivariate linear regression – regularized regression – Logistic regression – perceptrons – multilayer neural networks – learning neural networks structures – support vector machines – soft margin SVM – going beyond linearity – generalization and over fitting – regularization – validation.

UNIT III DISTANCE-BASED MODELS 9

Nearest neighbor models – K-means – clustering around medoids – silhouttes – hierarchical clustering – k-d trees – locality sensitive hashing – non-parametric regression – ensemble learning – bagging and random forests – boosting – meta learning.

UNIT IV PROBABILISTIC GRAPHICAL MODEL 9

Decision trees – learning decision trees – ranking and probability estimation trees – regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists – descriptive rule learning – association rule mining – first-order rule learning.

UNIT V ADVANCED LEARNING 9

Passive reinforcement learning – direct utility estimation – adaptive dynamic programming – temporal difference learning – active reinforcement learning – exploration – learning an action-utility function – Generalization in reinforcement learning – policy search – applications in game playing –applications in robot control.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Explain theory underlying machine learning (Understand)
- Construct algorithms to learn linear and non-linear models(create)
- Compute data clustering algorithms(Apply)
- Define algorithms for tree and rule-based models(Remember)
- Apply reinforcement learning techniques(Apply)

REFERENCES:

1. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, “Learning from Data”, AMLBook Publishers, 2012.
2. P. Flach,“Machine Learning: The art and science ofalgorithms that make sense of data”, Cambridge UniversityPress,2012.
3. K. P. Murphy, “Machine Learning: A probabilistic perspective”,MITPress, 2012.
4. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007.
5. D. Barber, “Bayesian Reasoning and Machine Learning”, Cambridge University Press, 2012.
6. M. Mohri, A. Rostamizadeh, andA. Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012.
7. T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997.
8. S. Russel and P. Norvig, “Artificial Intelligence: A Modern Approach”, Third Edition, Prentice Hall, 2009

15PCS103	ADVANCED OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To familiarize the students the fundamentals of Operating Systems
- To introduce Distributed operating system concepts that includes architecture, Mutual exclusion algorithms, Deadlock detection algorithms and agreement protocols.
- To explain distributed resource management components , the algorithms for implementation of distributed shared memory, recovery and commit protocols

UNIT I FUNDAMENTALS OF OPERATING SYSTEMS 9

Overview – Synchronization Mechanisms – Processes and Threads -Process Scheduling – Deadlocks: Detection, Prevention and Recovery – Models of Resources – Memory Management Techniques.

UNIT II DISTRIBUTED OPERATING SYSTEMS 9

Architecture -Issues in Distributed Operating System – Communication Primitives – Lamport‟s Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms.

UNIT III DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File Systems – Design Issues -Distributed Shared Memory – Algorithms for Implementing Distributed Shared memory–Issues in Load Distributing – Synchronous and Asynchronous Check Pointing and Recovery – Fault Tolerance – Two-Phase Commit Protocol – Nonblocking Commit Protocol.

UNIT IV REAL TIME AND MOBILE OPERATING SYSTEMS 9

Basic Model of Real Time Systems -Characteristics-Applications of Real Time Systems – Real Time Task Scheduling -Handling Resource Sharing -Mobile Operating Systems – iOS and Android Architecture and SDK Framework-Services Layer -Core OS Layer.

UNIT V CASE STUDIES 9

Linux System: Design Principles -Kernel Modules -Process Management Scheduling – Memory Management -Input-Output Management -File System – Inter process Communication. Windows 2000/XP-Design principles-System Components.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Discuss the synchronization mechanism, various scheduling, memory management and various resource management techniques for distributed systems. (Understand)
- Identify the different features of real time and mobile operating systems. (Remember)
- Explain the Mutual exclusion, Deadlock detection and agreement protocols of Distributed Operating Systems. (Understand)
- Analyze and use available Mobile operating Systems. (Analyze)
- Relate available open source kernels in terms of functionality or features used. (Create)

REFERENCES:

1. Mukesh Singhal and Niranjan G. Shivaratri, “Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems”, Tata McGraw-Hill, 2001.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, “Operating System Concepts”, Seventh Edition, John Wiley&Sons,2004.
3. Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O‟Reilly, 2005.
4. Rajib Mall, “Real-Time Systems: Theory and Practice”, Pearson Education India, 2006.
5. Neil Smyth, “iPhone iOS 4 Development Essentials – Xcode”, Fourth Edition, Payload media, 2011.

15PCS104	ADVANCED DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES:

- To develop programming skills in design and implementation of data structures

LIST OF EXPERIMENTS

1. Min Heap and Max Heap
2. Min-Max Heap
3. Deap
4. Leftist Heap
5. Binary search Tree
6. AVL Tree
7. Red black Tree
8. Tries
9. Convex Hull
10. Implementation of segment Trees
11. Parallel Algorithm for Array Max
12. Parallel Algorithm for Matrix Multiplication

TOTAL: 45 Periods

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

- Develop java codes to implement Data structures(Synthesis)
- Manipulate the given data into heap and tree structures (Apply)
- Classify various heap structures. (Understand)
- Analyze appropriate data structure for the given problem (Analyze)
- Demonstrate problem solving techniques through simple programs (Apply)

15PCS201	DATA SCIENCE AND BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce to big data and the Data Analytics Lifecycle to address business challenges that leverage big data
- To provide grounding in basic and advanced analytic methods
- To demonstrate big data analytics technology and tools, including MapReduce and Hadoop

UNIT I INTRODUCTION TO BIG DATA ANALYTICS 9

Big Data overview, State of the practice in analytics role of data scientists, Big Data Analytics in industry verticals

UNIT II END-TO-END DATA ANALYTICS LIFE CYCLE 9

key roles for successful analytic project, main phases of life cycle, Developing core deliverables for stakeholders.

UNIT III BASIC ANALYTIC METHODS 9

Introduction to "R", analyzing and exploring data with "R", statistics for model building and evaluation

UNIT IV ADVANCED ANALYTICS AND STATISTICAL MODELING FOR BIG DATA 9

Naïve Bayseian Classifier, K-means Clustering, Association Rules, Decision Trees, Linear and Logistic Regression, Time Series Analysis, Text Analytics

UNIT V CLOUD DATA PROCESSING 9

Technology and Tools – MapReduce/Hadoop , In- database Analytics ,MADlib and advanced SQL Tools

TOTAL: 45 Periods

COURSE OUTCOMES:

At the end of the course student will be able to

- Explain the Data Analytics Lifecycle (Understand)
- Apply appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights that can lead to actionable results (Apply)
- Select appropriate data visualizations to clearly communicate analytic insights to business sponsors and analytic audiences (Analyse)
- Use tools such as: R and RStudio, MapReduce/Hadoop, in-database analytics, Window and MADlib functions (Create)

REFERENCES:

1. Noreen Burlingame ,"The little book on Big Data", New Street publisher(eBook)
2. http://www.prlog.org/11800911-just-published-the-little-book-of-big-data-2012-edition.html
3. Norman Matloff ,The Art of R Programming: A Tour of Statistical Software Design , ISBN-13: 978-1-59327-384-2; ISBN-10: 1-59327-384-3
4. http://www.johndcook.com/R_language_for_programmers.html
5. http://bigdatauniversity.com/
6. http://home.ubalt.edu/ntsbarsh/stat-data/topics.htm#rintroduction

15PCS205/ 15PNE203 **NETWORK SECURITY**

L	T	P	C
3	0	0	3

OBJECTIVES :

- To explain the principles and practices of Cryptography network Security.
- To give knowledge on various types of security.
- To give an idea about the security challenges in emerging systems, and wireless networks.

UNIT I CONVENTIONAL ENCRYPTION 9

Introduction, Conventional encryption model, Steganography, Data Encryption Standard, block cipher, Encryption algorithms.

UNIT II PUBLIC KEY ENCRYPTION 9

Principles of public key cryptosystems, RSA algorithm, discrete logarithm, Diffie-Hellman Key Exchange. Elliptic Curve Cryptology, message authentication and Hash functions, Hash and Mac algorithms, Digital signatures.

UNIT III IP SECURITY 9

IP Security Overview, IP security Architecture, authentication Header, Security payload, security associations, Key distribution and Management**.**

UNIT IV WEB SECURITY 9

Web security requirement, secure sockets layer, transport layer security, secure electronic transaction, dual signature.

UNIT V SYSTEM SECURITY 9

Intruders, Viruses, Worms, firewall design, Trusted systems, antivirus techniques, digital Immune systems.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Describe various encryption models (Knowledge)
- Solve problems in public and private key encryption.(Apply)
- Describe various IP, web and system security issues(understand)
- Determine the security requirements for diverse applications(Analyze)
- Evaluate the security of a cryptographic algorithm based on its characteristics (Evaluate)

REFERENCES:

1. William Stallings," Cryptography and Network security", 2nd Edition,Prentice Hall of India, New Delhi,1999
2. Bruce, Schneier, Applied Cryptography, 2nd Edition, Toha Wiley & Sons, 1996.
3. Man YoungRhee, "Internet Security", Wiley, 2003.
4. Pfleeger &Pfleeger, "Security in Computing", Pearson Education, 3rd Edition, 2003.

15PCS202	INTERNALS OF ANDROID	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce the internals of Android OS
- To provide an overview on the structure of android applications
- To explore the services for android application development

UNIT I **INTRODUCTION** **8**

History-Features and Characteristics-Development Model-Legal Framework-Hardware and Compliance Requirements-Development setup and tools

UNIT II **ANDROID OVERVIEW** **8**

Anatomy of an Android App- App lifecycle- GUI development: XML for UI design, development tools, Activities, multiple activities, Activity lifecycle, Intents-MVC.

UNIT III **ANDROID OS INTERNALS** **9**

App Developer's View-Overall Architecture-Linux Kernel-Hardware Support-Native User Space-Dalvik and Android's Java-System Services-Stock AOSP Packages-System Startup.

UNIT IV **ANDROID APPLICATION DEVELOPMENT** **12**

Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications- Web service integration: JSON, XML, SOAP and RESTful services, cross-platform application development (Cordova, HTML5, CSS3, Javascript), Network connectivity, Telephony APIs.

UNIT V **ANDROID OPEN SOURCE PROJECT** **8**

Getting the AOSP-Inside the AOSP-Build Basics-Running Android-Using ADB

TOTAL: 45 Periods

COURSE OUTCOMES:

At the end of the course students will be able to

- Explain the internals of the Android OS (Understand)
- Determine the services to be deployed in an android application based on user requirements (Evaluate)
- Identify appropriate web services to create mobile applications (Analyse)
- Develop cross-platform mobile applications using Cordova, HTML5, CSS3, and JavaScript.(Create)

REFERENCES:

1. Yaghmour, K ., Android Internals Primer, Embedded Android, , O'Reilly Press,2013
2. Sumi Helal, Raja Bose, Wendong Li. Mobile Platforms and Development environments, Synthesis Lectures, Morgan Claypool, http://www.morganclaypool.com/doi/pdf/10.2200/S00404ED1V01Y201202MPC009
3. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
4. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012.
5. JamesDovey and Ash Furrow, "Beginning Objective C",Apress, 2012.
6. http://developer.android.com/develop/index.html

7. http://www.sourcebits.com
8. http://www.theserverside.com/tutorial/Mobile-application-development-tutorial
9. http://www.3pillarglobal.com
10. http://qt-project.org/doc/qtcreator-2.8/creator-deploying-android.html

15PCS203 CLOUD INFRASTRUCTURE LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- To learn how to use Cloud Services
- To implement Virtualization
- To implement Task Scheduling algorithms
- To implement Energy-conscious model
- To build Private Cloud

LIST OF EXPERIMENTS

1. Study and Usage of Google Apps.
2. Implement Virtual OS using virtual box.
3. Simulate VM allocation algorithm using cloudSim
4. Simulate Task Scheduling algorithm using CloudSim
5. Simulate Energy-conscious model using CloudSim
6. Setup a Private Cloud Using Open Stack or Eucalyptus.
7. Install and configure Open Stack Object Storage - Swift in Ubuntu
8. Implement Open Stack Nova-Compute
9. Implement Open Stack Image services – Glance.
10. Implement Map Reduce concept for an application

TOTAL: 45 Periods

COURSE OUTCOMES:

At the end of the course students will be able to

- Analyze the use of Cloud Applications
- Apply resource allocation, scheduling algorithms
- Implement Energy-conscious model
- Create virtual machines from available physical resources
- Setup a private cloud
- Familiarize with Open Source Cloud computing Software

15PCS204	INDUSTRIAL TRAINING/INTERNSHIP	L	T	P	C
		0	0	2	1

OBJECTIVES:

- To provide hands on training in an industry or a research institution or an academic institution
- To provide knowledge on practical applications for the theoretical concepts studied

A candidate has to undergo practical training for two weeks in an approved organization related to their branch of study during the vacation period of first semester or should be accommodated in the UG programme laboratory during the second semester. After successful completion of the training the student shall submit the report.

EVALUATION PROCESS

The evaluation is based on the successful completion of the Industrial Training/ Internship, report submitted by the candidate and a viva-voce examination done by a three member panel. The evaluation is done for 100 marks.

COURSE OUTCOME:

After successful completion of this course, the students will be able to:

- Develop analytical/hardware/software/experimental skills
- Prepare and present technical reports
- Apply practical knowledge to their project work

15PCS303/ 15PNE301 **MOBILE AND PERVASIVE COMPUTING**

L	T	P	C
4	0	0	4

OBJECTIVES :

- To familiarize the students the basics and architecture of Mobile Computing
- To make the students aware of emerging technologies in mobile and pervasive computing
- To introduce the underlying wireless networks and mobile OS.

UNIT I INTRODUCTION 12

Mobility of bits and bytes -Mobile computing – Networks -Middleware and gateways Applications and services -Developing mobile computing applications -Security in mobile computing -Architecture for mobile computing considerations for mobile computing

UNIT II MOBILE TECHNOLOGIES 12

Multiple Access procedures -mobile computing through telephone -Voice XML -Telephony Application Programming Interface -Emerging Technologies: Radio Frequency Identification (RFID) -Wireless Broadband (WiMAX) -Mobile IP -Internet Protocol Version 6(IPv6) -Java Card -CDMA and 3G:Spread Spectrum Technology -Is95 -CDMA versus GSM -Wireless Data -Third Generation Networks(3G) -Applications on 3G.

UNIT III MOBILE NETWORKING 12

Wireless LAN -advantages – standards – architecture – mobility – deploying -mobile adhoc networks and sensor networks-security -WiFi versus 3G, Internet and internetworking: fundamentals of call processing -intelligence in the networks -SS#7 signaling -IN conceptual model -soft switch -programmable networks, mobile OS: windows CE -Palm OS -Symbian OS.

UNIT IV PERVASIVE COMPUTING 12

Introductory concepts -Pervasive Computing – market -m-Business Application examples devices and interfaces -human machine interfaces – Biometrics -operating systems issues Java in Pervasive Computing.

UNIT V PERVASIVE DEVICES 12

WAP -infrastructure and security issues -WML -Voice Standards -Speech Applications and Security – PDA -Pervasive web application architecture -Smart phones.

TOTAL: 60 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Recall various advanced mobile network models.(Remember)
- Explain the concepts of mobile computing through voice. (Understand)
- Use mobile OS to develop mobile computing environment. (Apply)
- Develop mobile computing applications based on mobile networking. (Create)
- Describe basic architecture for a pervasive computing environment. (Remember)

REFERENCES:

1. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile Computing: Technology, Applications and Service Creation”, Second Edition, Tata McGraw Hill,2010.
2. Uwe Hansmaan etal, „Principles of Mobile Computing‟, Springer, 2003
3. Jochen Burtha rdt et al, „Pervasive Computing: Technology and Architecture of Mobile InternetApplications‟, Pearson Education, 2003
4. Feng Zhao and Leonidas Guibas, „Wireless Sensor Networks‟, Morgan Kaufmann Publishers, 2004

15PCS301	MULTICORE ARCHITECTURE	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce the recent trends in the field of Computer Architecture and identify performance related parameters
- To explain the need for parallel processing
- To outline the different types of multicore architectures and familiarize the students in multicore programming

UNIT I NEED FOR MULTICORE ARCHITECTURES 9

Fundamentals of Computer Design -Measuring and Reporting Performance -Instruction Level Parallelism and its Exploitation -Concepts and Challenges – Limitations of ILP – Multithreading – SMT and CMP Architectures – The Multicore era.

UNIT II MULTIPROCESSOR ISSUES 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 Interconnection Networks.

UNIT III MULTICORE ARCHITECTURES 9

Homogeneous and Heterogeneous Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture – GPGPU Architectures.

UNIT IV 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.

UNIT V MULTICORE PROGRAMMING 9

Parallel Programming models – Shared Memory Programming – Message Passing Interface – Open MP Program Development and Performance Tuning.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Identify the limitations of ILP and the need for multicore architectures (Analyze)
- Discuss the issues related to multiprocessing and suggest solutions (Understand)
- Point out the salient features of different multicore architectures and how they exploit parallelism (Analyze)
- Explain the different parallel programming models (Understand)
- Develop programs using open mp and optimize them (Evaluate)

REFERENCES:

1. John L. Hennessey andDavidA. Patterson, “Computer Architecture – A Quantitative Approach”, Morgan Kaufmann /Elsevier,5th.Edition, 2012.
2. Peter S. Pacheco, “An Introduction to Parallel Programming”, Morgan Kaufmann / Elsevier, 2011.
3. Michael J Quinn, Parallel Programming in C with MPI and OpenMP, Tata McGraw Hill, 2003.
4. Darryl Gove, “Multicore Application Programming: For Windows, Linux, and Oracle Solaris”,Pearson, 2011.

5. DavidE. Culler,Jaswinder PalSingh, “ParallelComputingArchitecture:AHardware/ Software Approach”, Morgan Kaufmann /Elsevier,1997.

15PCS302	PROJECT WORK (PHASE I)	L	T	P	C
		0	0	6	3

Every candidate shall be permitted to undertake a research based project work of his/her choice related to his / her discipline in consultation with the Head of the Department. The project shall be supervised by a faculty member of the Department in which the candidate registered a course. In case of a project work at Industrial / Research organization, the project work shall be jointly supervised by the faculty supervisor and an expert from the organization.

He / She shall be required to undergo three reviews in a semester to assess the progress of the project work. The project work shall be evaluated based on the project report submitted by the candidate and Viva-voce examination conducted by a committee consisting of an external examiner, internal examiner, and the supervisor of the candidate.

15PCS401	PROJECT WORK (PHASE II)	L	T	P	C
		0	0	30	15

Every candidate shall be permitted to undertake a research based project work of his/her choice related to his / her discipline in consultation with the Head of the Department. The project shall be supervised by a faculty member of the Department in which the candidate registered a course. In case of a project work at Industrial / Research organization, the project work shall be jointly supervised by the faculty supervisor and an expert from the organization.

He / She shall be required to undergo three reviews in a semester to assess the progress of the project work. The project work shall be evaluated based on the project report submitted by the candidate and Viva-voce examination conducted by a committee consisting of an external examiner, internal examiner, and the supervisor of the candidate.

PROGRAM ELECTIVES

15PCS501	SOFTWARE REQUIREMENTS ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To give knowledge on system requirements, different types of requirements, elicitation of requirements
- To explain requirements documentation, documenting use cases, SRS document
- To outline managing requirements, managing changes, requirements metrics

UNIT I DOMAIN UNDERSTANDING 9

Introduction – Types of requirements – Requirements engineering process – Validating requirements – Requirements and design – Requirements and test cases – introduction to business domain – Problem analysis – Fish bone diagram – Business requirements – Business process modeling – Business use cases – Business modeling notations – UML Activity diagrams.

UNIT II REQUIREMENTS ELICITATION 9

Introduction – Understanding stakeholders' needs – Elicitation techniques – interviews, questionnaire,workshop, brainstorming, prototyping –documenting stakeholders' needs.

UNIT III FUNCTIONAL REQUIREMENTS 9

Introduction – Features and Use cases – Use case scenarios – Documenting use cases – Levels of details – SRS documents

UNIT IV QUALITY ATTRIBUTES AND USER EXPERIENCE 9

Quality of solution – Quality attributes – Eliciting quality attributes – Quality attribute workshop (QAW) – Documenting quality attributes – Six part scenarios – Usability requirements – Eliciting and documenting usability requirements – Modeling user experience – Specifying UI design

UNIT V MANAGING REQUIREMENTS 9

Defining scope of the project – Context diagram – Managing requirements – Requirements properties – Traceability – Managing changes – Requirements metrics – Requirements management tools.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Discuss a process for requirements engineering. (Understand)
- State a process for gathering requirements through elicitation techniques.(Remember)
- Justify requirements according to criteria such as feasibility, clarity, preciseness etc.(Evaluate)
- Summarize functional requirements, and quality attributes. (Understand)
- Illustrate, detect and resolve feature interactions. (Analyze)

REFERENCES:

1. Axel van Lamsweerde, "Requirements Engineering", Wiley, 2009
2. Gerald Kotonya, Ian Sommerville, "Requirements Engineering: Processes and Techniques", John Wiley and Sons, 1998

3. Dean Leffingwell and Don Widrig, “Managing Software Requirements: A Use Case Approach (2nd Edition) ”, Addison-wesley, 2003
4. Brian Berenbach, DanielJ.Paulish, Juergen Kazmeier, Arnold Rudorfer,”Software & System requirements Engineering in practice”, McGraw Hill Publication, 2000.
5. SEIReport, “Quality Attributes Workshop”, http:// www.sei.cmu.edu /library /abstracts /reports /03tr016.cfm , 2003
6. J Nielsen, “UsabilityEngineering”,AcademicPress,1993

15PCS502 SOFTWARE ARCHITECTURES AND DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES :

- To introduce software architectural drivers
- To make the students understand architectural views and documentation
- To familiarize the students with the various styles, design and evaluation of software architectures

UNIT I ARCHITECTURAL DRIVERS 9

Introduction – Standard Definitions of Software Architecture– Architectural structures – Influence of software architecture on organization – Architecture Business Cycle – Functional requirements – Technical constraints – Quality Attributes – Quality Attribute Workshop (QAW) – Documenting Quality Attributes – Six part scenarios.

UNIT II ARCHITECTURAL VIEWS AND DOCUMENTATION 9

Introduction – Standard Definitions for views – Structures and views-Perspectives: Static, dynamic and physical and the accompanying views – Representing views-available notations – Good practices in documentation– Documenting the Views using UML – Merits and Demerits of using visual languages – Need for formal languages -Architectural Description Languages – ACME.

UNIT III ARCHITECTURAL STYLES 9

Introduction – Data flow styles – Call-return styles – Shared Information styles – Event styles – Case studies for each style.

UNIT IV ARCHITECTURAL DESIGN 9

Approaches for architectural design – System decomposition – Attributes driven design – Architecting for specific quality attributes – Performance, Availability – Security – Architectural conformance .

UNIT V ARCHITECTURE EVALUATION 9

Evaluating a Software Architecture -The ATAM-A Method for Architecture Evaluation -SAAM to Evaluate an Example Architecture -ARID-An Evaluation Method for Partial Architectures

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Explain key architectural drivers
- Demonstrate documentation of architectural views using UML
- Illustrate various architectural styles
- Analyze the software architecture design of a given problem
- Explain the various architecture evaluation methods

REFERENCES:

1. Len Bass, PaulClements, and RickKazman, “Software Architectures in Practice”, 2nd Edition, Addison-Wesley, 2003.
2. Anthony J Lattanze, “Architecting Software Intensive Systems: A Practitioner's Guide”, Auerbach Publications, 2010.
3. Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Paulo Merson, Robert Nord, and Judith Stafford, “Documenting Software Architectures. Views and Beyond”,2nd Edition, Addison-Wesley, 2010.
4. Paul Clements, Rick Kazman, and Mark Klein, “Evaluating software architectures: Methods and case studies.”, Addison-Wesley, 2001.
5. David Garlan and Mary Shaw, “Software architecture: Perspectives on an emerging discipline”, Prentice Hall, 1996.

15PCS503	SOFTWARE QUALITY ASSURANCE	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To explain the various approaches to ensure the quality assurance.
- To give knowledge on the different types of testing strategies.
- To give idea about the system based on the chosen quality model.

UNIT I INTRODUCTION 9

Introduction – Views on quality – Cost of quality -Quality models – Quality frameworks – Verification and Validation – Defect taxonomy – Defect management – Statistics and measurements – IEEE standards – Quality assurance and control processes.

UNIT II VERIFICATION 9

Introduction – Verification techniques – Inspections, reviews, walk-throughs – Case studies.

UNIT III TEST GENERATION 9

Software testing-Validation – Test plan – Test cases -Test Generation – Equivalence partitioning – Boundary value analysis – Category partition method – Combinatorial generation – Decision tables – Examples and Case studies.

UNIT IV STRUCTURAL TESTING 9

Introduction – Test adequacy criteria – Control flow graph – Coverages: block, conditions, multiple conditions, MC/DC, path – Data flow graph – Definition and use coverages – C-use, P-use, Def-clear, Def-use – Finite state machines – Transition coverage – Fault based testing – Mutation analysis – Case studies

UNIT V FUNCTIONAL TESTING 9

Introduction – Test adequacy criteria -Test cases from use cases – Exploratory testing Integration, system, acceptance, regression testing – Testing for specific attributes: Performance, load and stress testing – Usability testing – Security testing -Test automation– Test oracles.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Describe different quality models to ensure quality assurance.(Understand).
- Analyze specifications and identify appropriate test generation strategies (Analyze)
- Develop suitable test cases to exercise a software (Create).
- Apply test adequacy criteria to ensure adequate testing (Apply)
- Assess the testing effort based on adequacy measures.(Evaluate)

REFERENCES:

1. Boriz Beizer, "Software Testing Techniques", 2nd Edition, DreamTech, 2009.
2. Aditya P. Mathur, "Foundations of Software Testing", Pearson, 2008
3. Mauro Pezze and Michal Young, "Software Testing and Analysis. Process, Principles, and Techniques", John Wiley 2008
4. Stephen H. Kan, "Metrics and Models in Software Quality Engineering", 2nd Edition, Pearson, 2003
5. Kshirasagar Naik and Priyadarshi Tripathy (Eds), "Software Testing and Quality Assurance: Theory and Practice", John Wiley, 2008
6. "Combinatorial Methods in Software Testing", http:// csrc.nist.gov/ groups/ SNS/ acts/ index.html
7. Ilene Burnstein, “Practical Software Testing”, Springer International Edition, Chennai, 2003

15PCS504 OPEN SOURCE SYSTEMS AND NETWORKING

L	T	P	C
3	0	0	3

OBJECTIVES :

- To make the students to understand the basic issues in open source kernels.
- To familiarize the different roles played by the processes, files and devices.
- To get an idea about the different aspects of open source networking and internetworking

UNIT I FOUNDATION **9**

Introduction – Memory addressing – Processes – Interrupts and exceptions – Kernel synchronization – clock and timer circuits.

UNIT II PROCESSES **9**

Process scheduling: policy, algorithm, system calls – Memory management: page frame management, memory area management, slab allocator, aligning objects in memory, noncontiguous memory area management, addresses of non-contiguous memory areas – Process address space: process's address space, foundational aspects of memory regions, page fault exception handler, creation and deletion – System calls – Signals: foundational aspects of the role of signals, generating a signal, delivering a signal and system calls – implementation aspects of processes.

UNIT III FILES & DEVICES **9**

Virtual File System – I/O architecture and device drivers, block devices handling, the generic block layer, block device drivers – Implementation aspects of files and devices.

UNIT IV NETWORKING **9**

Introduction, data structures overview, user space to kernel interface – System initialization: reasons for notification chains, system initialization overview, device registration and initialization, goals of NIC initialization, interaction between devices and kernel, examples of virtual devices, boot time kernel options, when a device is registered and unregistered – Transmission and reception: decisions and traffic direction, notifying drivers, interrupt handlers, reasons for bottom half handlers, bottom halves solutions, concurrency and locking, pre-emption, overview of network stack – Bridging: concepts, spanning tree protocol – Implementation aspects of networking.

UNIT V INTERNETWORKING **9**

IPv4 concepts – Neighboring subsystem concepts – Routing concepts, advanced features – Implementation aspects of internetworking.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Describe different features of open source kernels(Remember)
- Set up and use available open source kernel(Synthesis)
- Modify existing open source kernels in terms of functionality or features used(Apply)
- Identify different features of open source networking(Analysis)
- Use existing open source networking modules(Apply)

REFERENCES:

1. Daniel P Bovet and Marco Cesati, “Understanding the Linux kernel”, 3rd edition, O‟Reilly, 2005
2. Christian Benvenuti, “Understanding Linux Network Internals”, O‟Reilly, 2006.
3. Y-D Lin, R-H Hwang and Fred Baker, “Computer networks – an open source approach”, McGraw-Hill, 2012.
4. Alessandro Rubiniand Jonathan Corbet, “Linux device drivers”,2nd edition, O‟Reilly, 2001.
5. Maurice J Bach, “The design of the Unix operating system”, Pearson, 1986

15PCS505	COMPILER OPTIMIZATION TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To learn the optimization techniques used in compiler design.
- To learn the aware of the various computer architectures that support parallelism.
- To learn the techniques used for identifying parallelism in a sequential program.

UNIT I INTRODUCTION 9

Language Processors -The Structure of a Compiler – The Evolution of Programming Languages-The Science of Building a Compiler – Applications of Compiler Technology Programming Language Basics -The Lexical Analyzer Generator -Parser Generator Overview of Basic Blocks and Flow Graphs -Optimization of Basic Blocks -Principle Sources of Optimization.

UNIT II INSTRUCTION-LEVEL PARALLELISM 9

Processor Architectures – Code-Scheduling Constraints – Basic-Block Scheduling –Global Code Scheduling – Software Pipelining.

UNIT III OPTIMIZING FOR PARALLELISM AND LOCALITY-THEORY 9

Basic Concepts – Matrix-Multiply: An Example -Iteration Spaces -Affine Array Indexes – Data Reuse Array data dependence Analysis.

UNIT IV OPTIMIZING FOR PARALLELISM AND LOCALITY – APPLICATION 9

Finding Synchronization -Free Parallelism – Synchronization Between Parallel Loops – Pipelining – Locality Optimizations – Other Uses of Affine Transforms.

UNIT V INTERPROCEDURAL ANALYSIS 9

Basic Concepts – Need for Inter procedural Analysis – A Logical Representation of Data Flow – A Simple Pointer-Analysis Algorithm – Context Insensitive Inter procedural Analysis Context-Sensitive Pointer-Analysis -Datalog Implementation by Binary Decision Diagrams

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Explain the basic techniques used in compiler construction such as lexical analysis, top-down, bottom-up parsing and intermediate code generation(Understand)
- Identify the optimizations that are possible for a sequence of code.(Remember)
- Design Compilers for a programming language.(Create)
- Describe on optimizations for parallelism and locality (Understand)
- Map the process of Compilation for a programming paradigm and design compiler for the same(Create)

REFERENCES:

1. Alfred V. Aho, Monica S.Lam, Ravi Sethi, Jeffrey D.Ullman, “Compilers: Principles, Techniques and Tools”, Second Edition, Pearson Education,2008.
2. Randy Allen, Ken Kennedy, “Optimizing Compilers for Modern Architectures: A Dependence-based Approach”, Morgan Kaufmann Publishers,2002.
3. Steven S. Muchnick, “Advanced Compiler Design and Implementation”, Morgan Kaufmann Publishers -Elsevier Science, India, Indian Reprint 2003.
4. Andrew W. Appel and Jens Palsberg, “Compiler Implementation in Java”,(2nd Ed.),Cambridge University Press, 2002
5. Keith D. Cooper, Linda Torczon, “Engineering a Compiler”, MK Publishers, 2003

15PCS506	INFORMATION STORAGE TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To familiarize the various challenges & solutions for data storage & to learn the elements of data center.
- To understand the physical & logical components of storage system and its architecture.
- To explain the various storage networking technologies and data archival solution.

UNIT I INTRODUCTION TO STORAGE TECHNOLOGY 9

Review data creation and the amount of data being created and understand the value of data to a business, challenges in data storage and data management, Solutions available for data storage, Core elements of a data center infrastructure, role of each element in supporting business activities.

UNIT II STORAGE SYSTEMS ARCHITECTURE 9

Hardware and software components of the host environment, Key protocols and concepts used by each component ,Physical and logical components of a connectivity environment ,Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics, and performance Implications, Concept of RAID and its components, Different RAID levels and their suitability for different application environments: RAID 0, RAID 1, RAID 3, RAID 4, RAID 5, RAID 0+1, RAID 1+0, RAID 6, Compare and contrast integrated and modular storage systems ,High-level architecture and working of an intelligent storage system.

UNIT III INTRODUCTION TO NETWORKED STORAGE 9

Evolution of networked storage, Architecture, components, and topologies of FC-SAN, NAS, and IP-SAN, Benefits of the different networked storage options, understand the need for long-term archiving solutions and describe how CAS full fill the need, understand the appropriateness of the different networked storage options for different application environments.

UNIT IV INFORMATION AVAILABILITY, MONITORING & MANAGING DATACENTER 9

List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime -Differentiate between business continuity (BC) and disaster recovery (DR) ,RTO and RPO, Identify single points of failure in a storage infrastructure and list solutions to mitigate these failures, Architecture of backup/recovery and the different backup/ recovery topologies, replication technologies and their role in ensuring information availability and business continuity, Remote replication technologies and their role in providing disaster recovery and business continuity capabilities. Identify key areas to monitor in a data center, Industry standards for data center monitoring and management, Key metrics to monitor for different components in a storage infrastructure, Key management tasks in a data center.

UNIT V SECURING STORAGE AND STORAGE VIRTUALIZATION 9

Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain, Virtualization technologies, block-level and file-level virtualization technologies and processes

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Discuss different elements and components in storage systems. (Understand)
- Analyze various storage networking techniques. (Analyze)
- Apply virtualization techniques at various levels.(Apply)
- Analyze the common storage management activities and solutions. (Analyze)
- Explain information security & storage security domains. (Understand)

REFERENCES:

1. Information Storage and Management: Storing, Managing, and Protecting Digital Information; Wiley India, 2009.
2. Information Storage and Management Second Edition: Storing, Managing, and Protecting Digital Information in Classic, Virtualized, and Cloud Environments; Wiley India, 2012.
3. RobertSpalding, “Storage Networks:The Complete Reference“, Tata McGraw Hill, Osborne, 2003.
4. Marc Farley, “Building Storage Networks”, TataMcGraw Hill, Osborne, 2001.
5. Ulf Troppens, Wolfgang Mueller-Friedt, Rainer Erkens, Rainer Wolafka, Nils Haustein, “Storage Networks Explained: Basic and application of fiber channels, SAN, NAS, iSCSI, INFINIBAND and FCOE”, 2nd Edition, Wiley India, 2009.
6. Meeta Gupta, Storage Area Network Fundamentals, Pearson Education Limited, 2002.
7. Additional resource material on www.emc.com/resource-library/resource-library.esp

15PCS507	ENERGY AWARE COMPUTING	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To familiarize students the fundamental principles of energy efficient devices
- To introduce energy efficient algorithms
- To explain the students to know energy efficient techniques involved to support real time systems.

UNIT I INTRODUCTION 9

Energy efficient network on chip architecture for multi core system-Energy efficient MIPS CPU core with fine grained run time power gating – Low power design of Emerging memory technologies.

UNIT II ENERGY EFFICIENT STORAGE 9

Disk Energy Management-Power efficient strategies for storage system-Dynamic thermal management for high performance storage systems-Energy saving technique for Disk storage systems.

UNIT III ENERGY EFFICIENT ALGORITHMS 9

Scheduling of Parallel Tasks – Task level Dynamic voltage scaling – Speed Scaling – Processor optimization-Memetic Algorithms – Online job scheduling Algorithms.

UNIT IV REAL TIME SYSTEMS 9

Multiprocessor system – Real Time tasks-Energy Minimization – Energy aware scheduling-Dynamic Reconfiguration-Adaptive power management-Energy Harvesting Embedded system.

UNIT V ENERGY AWARE APPLICATIONS 9

On chip network – Video codec Design – Surveillance camera-Low power mobile storage.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Design a Power efficient architecture Hardware and Software. (Create)
- Analyze power and performance tradeoff between various energy aware storage devices. (Analyze)
- Explain various energy aware algorithms. (Evaluate)
- Reconstruct the software and Hardware for Energy aware applications. (Create)
- Discuss the Energy aware applications.(Understand)

REFERENCES:

1. Ishfaq Ah mad, Sanjay Ranka, “Handbook of Energy Aware and Green Computing”, Chapman and Hall/CRC, 2012
2. Chong-Min Kyung, Sungioo yoo, “Energy Aware system design Algorithms and Architecture”, Springer, 2011.
3. Bob steiger Wald, Chris: Luero, Energy Aware computing, Intel Press, 2012.

15PCS508	WEB DATA MINING	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To Learn the use of machine learning approaches for Web Content Mining
- Give knowledge on the role of hyper links in web structure mining
- To Explain the various aspects of web usage mining.

UNIT I INTRODUCTION 8

Introduction – Web Mining – Theoretical background –Algorithms and techniques – Association rule mining – Sequential Pattern Mining -Information retrieval and Web search – Information retrieval Models-Relevance Feedback-Text and Web page Pre-processing – Inverted Index – Latent Semantic Indexing – Web Search – Meta-Search – Web Spamming.

UNIT II WEB CONTENT MINING 10

Web Content Mining – Supervised Learning – Decision tree -Naïve Bayesian Text Classification - Support Vector Machines -Ensemble of Classifiers. Unsupervised Learning -K-means Clustering - Hierarchical Clustering –Partially Supervised Learning – Markov Models -Probability-Based Clustering - Evaluating Classification and Clustering – Vector Space Model – Latent semantic Indexing – Automatic Topic Extraction -Opinion Mining and Sentiment Analysis – Document Sentiment Classification.

UNIT III WEB LINK MINING 9

Web Link Mining – Hyperlink based Ranking – Introduction -Social Networks Analysis-Co-Citation and Bibliographic Coupling -Page Rank -Authorities and Hubs -Link-Based Similarity Search -Enhanced Techniques for Page Ranking -Community Discovery – Web Crawling -A Basic Crawler Algorithm-Implementation Issues-Universal Crawlers-Focused Crawlers-Topical Crawlers-Evaluation -Crawler Ethics and Conflicts -New Developments.

UNIT IV STRUCTURED DATA EXTRACTION 8

Structured Data Extraction: Wrapper Generation – Preliminaries-Wrapper Induction-Instance-Based Wrapper Learning ·-Automatic Wrapper Generation: Problems -String Matching and Tree Matching - .Multiple Alignment -Building DOM Trees -Extraction Based on a Single List Page and Multiple pages-Introduction to Schema Matching -Schema-Level Match -Domain and Instance-Level Matching – Extracting and Analyzing Web Social Networks.

UNIT V WEB USAGE MINING 10

Web Usage Mining -Click stream Analysis -Web Server Log Files -Data Collection and Pre-Processing -Cleaning and Filtering-Data Modelling for Web Usage Mining -The BIRCH Clustering Algorithm - Affinity Analysis and the A Priori Algorithm – Binning. Discovery and Analysis of Web Usage Patterns – Modelling user interests –Probabilistic Latent Semantic Analysis – Latent Dirichlet Allocation Model– Applications-Collaborative Filtering-Recommender Systems – Web Recommender systems based on User and Item – PLSA and LDA Models.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Describe a sample search engine using available open source tools (Understand)
- Identify the different components of a web page that can be used for mining (Remember)
- Apply machine learning concepts to web content mining (Apply)
- Analyze social media data using appropriate data/web mining techniques (Analyze)
- Modify an existing search engine to make it personalized (Apply)

REFERENCES:

1. BingLiu, "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)", Springer, 2nd Edition 2009.
2. Guandong Xu, Yanchun Zhang, Lin Li, "Web Mining and Social Networking: Techniques and Applications", Springer;1stEdition, 2010.
3. Zdravko Markov, DanielT. Larose, "Data Mining the Web: Uncovering Patterns in Web Content, Structure, and Usage", John Wiley&Sons,Inc., 2007.
4. Soumen Chakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data", Morgan Kaufmann; edition 2002.
5. Adam Schenker, "Graph-Theoretic Techniques for Web Content Mining", World Scientific Pub Co Inc , 2005.
6. Min Song, Yi Fang and Brook Wu, "Handbook of research on Text and Web mining technologies", IGI global, information Science Reference – imprint of IGI publishing, 2008

15PCS509	MOBILE APPLICATIONS DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To outline system requirements for mobile applications
- To introduce suitable design for mobile development frameworks and generate mobile application design
- To make the students implement the design using specific mobile development frameworks and deploy the mobile applications in marketplace for distribution

UNIT I INTRODUCTION 5

Introduction to mobile applications – Embedded systems -Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II BASIC DESIGN 8

Introduction – Basics of embedded systems design – Embedded OS -Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT III ADVANCED DESIGN 8

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV TECHNOLOGY I –ANDROID 12

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment
– Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V TECHNOLOGY II –IOS 12

Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi – iPhone marketplace.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Describe the requirements for mobile applications (Remember)
- Explain the challenges in mobile application design and development (Understand)
- Develop design for mobile applications for specific requirements (Create)
- Create the design using Android SDK, Objective C and iOS (Create)
- Apply mobile applications in Android and iPhone marketplace for distribution(Apply)

REFERENCES:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
2. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”,

DreamTech, 2012.
3. James Dovey and Ash Furrow, “Beginning Objective C”,Apress, 2012.
4. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOSSDK”, Apress, 2013.
5. http://developer.android.com/develop/index.html
6. http://www.sourcebits.com
7. http://www.theserverside.com/tutorial/Mobile-application-development-tutorial
8. http://www.3pillarglobal.com
9. http://qt-project.org/doc/qtcreator-2.8/creator-deploying-android.html

15PCS510	INFORMATION RETRIEVAL TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce the basics of Information Retrieval with pertinence to modeling, query operations and indexing
- To explain the machine learning techniques for text classification and clustering.
- To give knowledge about the various applications of Information Retrieval giving emphasis to Multimedia IR, Web Search and digital libraries.

UNIT I INTRODUCTION TO DATA MINING 8

Motivation – Basic Concepts – Practical Issues -Retrieval Process – Architecture – Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems – History of Web Search – Web Characteristics – The impact of the web on IR – IR Versus Web Search–Components of a Search engine.

UNIT II MODELING 10

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model – Term Weighting – Scoring and Ranking – Language Models – Set Theoretic Models – Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing.

UNIT III INDEXING 9

Static and Dynamic Inverted Indices – Index Construction and Index Compression Searching – Sequential Searching and Pattern Matching. Query Operations – Query Languages – Query Processing – Relevance Feedback and Query Expansion – Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency.

UNIT IV CLASSIFICATION AND CLUSTERING 8

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering –Matrix decompositions and latent semantic indexing – Fusion and Meta learning.

UNIT V SEARCHING AND RANKING 10

Searching the Web – Structure of the Web – IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis -XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

TOTAL: 45 Periods

COURSE OUTCOMES:

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

- Model an Information Retrieval system using the available tools.(Analyze)
- Identify the various components of an Information Retrieval system.(Remember)
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.(Apply)
- Analyze the Web content structure.(Analyze)
- Design an efficient search engine.(Create)

REFERENCES:

1. Christopher D. Manning, Prabhakar Raghavan, HinrichSchutze, “Introduction to Information Retrieval”, Cambridge UniversityPress,First South Asian Edition 2012
2. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, “Information Retrieval

Implementing and Evaluating Search Engines", The MIT Press, Cambridge, Massachusetts London, England, 2010
3. Ricardo Baeza – Yates, Berthier Ribeiro – Neto, "Modern Information Retrieval: The concepts and Technology behind Search", ACM Press Books, Second Edition 2011
4. Jiawei Han, Micheline Kamber , Jian Pei, "Data Mining: Concepts and Techniques", Third Edition, The Morgan Kaufmann Series in Data Management Systems, 2012.
5. David A. Grossman,OphirFrieder, "Information Retrieval: Algorithms and Heuristics", Academic Press, 2000.
6. Charles T. Meadow, Bert R. Boyce, Donald H. Kraft, "Text Information Retrieval Systems", Academic Press,2000.

15PCS511	ROBOTICS	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To learn the concepts of robot locomotion and mobile robot kinematics
- To understand mobile robot localization and mobile robot mapping
- To analyze the simultaneous localization and mapping (SLAM)
- To understand robot planning and navigation

UNIT I LOCOMOTION AND KINEMATICS 9

Introduction to Robotics – key issues in robot locomotion – legged robots – wheeled mobile robots – aerial mobile robots – introduction to kinematics – kinematics models and constraints – robot Manoeuvrability

UNIT II ROBOT PERCEPTION 9

Sensors for mobile robots – vision for robotics – cameras – image formation – structure from stereo – structure from motion – optical flow – color tracking – place recognition – range data

UNIT III MOBILE ROBOT LOCALIZATION 9

Introduction to localization – challenges in localization – localization and navigation – belief representation – map representation – probabilistic map-based localization – Markov localization – EKF localization – UKF localization – Grid localization – Monte Carlo localization – localization in dynamic environments.

UNIT IV MOBILE ROBOT MAPPING 9

Autonomous map building – occupancy grip mapping – MAP occupancy mapping – SLAM – extended Kalman Filter SLAM – graph-based SLAM – particle filter SLAM – sparse extended information filter – fastSLAM algorithm .

UNIT V PLANNING AND NAVIGATION 9

Introduction to planning and navigation – planning and reacting – path planning – obstacle avoidance techniques – navigation architectures – basic exploration algorithms.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Explain robot locomotion(Understanding)
- Apply kinematics models and constraints(Apply)
- Analyze robot localization techniques and robot mapping techniques(Analyze)
- Explain planning and navigation in robotics(Understanding)
- Apply vision algorithms for robotics(Apply)

REFERENCES:

1. Roland Seigwart, Illah Reza Nourbakhsh, and Davide Scaramuzza, “Introduction to autonomous mobile robots”, Second Edition, MITPress, 2011.
2. Sebastian Thrun, Wolfram Burgard, and Dieter Fox, “Probabilistic Robotics”, MIT Press, 2005.
3. Howie Choset et al., “Principles of Robot Motion: Theory, Algorithms, and Implementations”, ABradfordBook, 2005.
4. Gregory Dudek and Michael Jenkin, “Computational Principles of Mobile Robotics”, Second Edition, Cambridge University Press, 2010.
5. Maja J.Mataric, “The Robotics Primer”, MITPress,2007.

15PCS512	WEB SERVICES	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To give knowledge on the basics of XML technology.
- To make the students to understand the background of distributed information system.
- To explain the design concepts of web service based application.
- To give an idea about the security features of web services and service composition

UNIT I DISTRIBUTED INFORMATION SYSTEM 9

Distributed information system – Design of IB – Architecture of IB – Communication in an IS – Middleware RPC – TP monitors – Object brokers – Message oriented middleware – EAI – EAI Middleware – Workflow –Management – benefits and limitations – Web technologies for Application Integration

UNIT II WEB SERVICES BUILDING BLOCK 9

Web Services – Definition – Web Services and EAI – Web Services Technologies – XML basics – web services Architecture – SOAP – WSDL – UDDI –WS – Addressing – WS – Routing – Web service implementation – Java based web services -.NET based web services

UNIT III WEB SERVICE SECURITY 9

XML signature – XML Encryption – SAML -XKMS – WS-Security –WS Policy –Web service security framework – .NET and passport – UDDI and security -web service security in java
– mobile web service security

UNIT IV SEMANTIC WEB SERVICES 9

Semantic web service – architecture – RDF Data model – RDF schema – OWL – ontology – role of ontology in web services -semantic Web service implementation issues

UNIT V PARALLEL ALGORITHMS 9

Service Coordination and Composition coordination protocols – WS – Coordination – WS – transaction – WSCI – Service Composition – Service Composition Models – Dependencies between coordination and composition – BPEL – Current trends

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Create, validate, parse, and classify XML documents.(remember)
- Design a middleware solution based application.(create)
- Develop web services using different technologies.(apply)
- Illustrate set of web services using BPEL.(analyze)
- Describe different types of web security(Understand)

REFERENCES:

1. Gystavo Alonso, Fabio casasi, Hareemi kuno, vijay machiraju, “web Services – concepts, Architecture and Applications”,Springer, 2004.
2. Ron Schmelzer etal“XML and Web Services”, Pearson Education, 2002.
3. Sandeep Chatterjee and James Webber,” Developing Enterprise web services: An Architect‟s and Guide”, Practice Hall, 2004.
4. Freunkp.coyle,”XML, WebServices and theData Revolution”,Pearson, 2002.
5. Jorge Cardoso, ”Semantic WebServices”,2006

15PCS513	IMAGE PROCESSING AND ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To give knowledge about spatial domain processing.
- To explain the frequency domain processing , segmentation and edge detection.
- To give an idea about processing of color images and image compression techniques.

UNIT I SPATIAL DOMAIN PROCESSING 9

Introduction to image processing – imaging modalities – image file formats – image sensing and acquisition – image sampling and quantization – noise models – spatial filtering operations – histograms – smoothing filters – sharpening filters – fuzzy techniques for spatial filtering – spatial filters for noise removal

UNIT II FREQUENCY DOMAIN PROCESSING 9

Frequency domain – Review of Fourier Transform (FT), Discrete Fourier Transform (DFT), and Fast Fourier Transform (FFT) – filtering in frequency domain – image smoothing – image sharpening – selective filtering – frequency domain noise filters – wavelets – Haar Transform – multiresolution expansions – wavelet transforms – wavelets based image processing

UNIT III SEGMENTATION AND EDGE DETECTION 9

Thresholding techniques – region growing methods – region splitting and merging – adaptive thresholding – threshold selection – global valley – histogram concavity – edge detection – template matching – gradient operators – circular operators – differential edge operators – hysteresis thresholding – Canny operator – Laplacian operator – active contours – object segmentation

UNIT IV INTEREST POINTS, MORPHOLOGY, AND TEXTURE 9

Corner and interest point detection – template matching – second order derivatives – median filter based detection – Harris interest point operator – corner orientation – local invariant feature detectors and descriptors – morphology – dilation and erosion – morphological operators – gray scale morphology – noise and morphology – texture – texture analysis – co-occurrence matrices – Laws' texture energy approach – Ade's eigen filter approach

UNIT V COLOR IMAGES AND IMAGE COMPRESSION 9

Color models – pseudo colors – full-color image processing – color transformations – smoothing and sharpening of color images – image segmentation based on color – noise in color images. Image Compression – redundancy in images – coding redundancy – irrelevant information in images – image compression models – basic compression methods – digital image watermarking

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Explain spatial domain Processing (Understand)
- Describe frequency domain transformations (Remember)
- Apply image thresholding and segmentation algorithms (Apply)
- Apply corner and interest point detection algorithms (Apply)
- Discuss various image compression algorithms (Understand)

REFERENCES:

1. E. R. Davies, “Computer &Machine Vision”, Fourth Edition, Academic Press,2012.
2. W. Burger and M. Burge, “Digital Image Processing: An Algorithmic Introduction using Java”, Springer, 2008.
3. John C.Russ, “The Image Processing Handbook”, Sixth Edition, CRC Press, 2011.

4. R. C. Gonzalez and R. E. Woods, “Digital Image Processing”, Third Edition, Pearson, 2008.
5. Mark Nixon and Alberto S. Aquado, “Feature Extraction & Image Processing for Computer Vision”, ThirdEdition, Academic Press, 2012.
6. D. L. Baggio et al., “Mastering OpenCV with Practical Computer Vision Projects”, Packet Publishing, 2012.
7. Jan Erik Solem, “Programming Computer Vision with Python: Tools and algorithms for analyzing images”, O'Reilly Media, 2012.

15PCS514	MANAGING BIG DATA	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To understand big data for business intelligence
- To familiarize business case studies for big data analytics
- To explain NoSQL big data management

UNIT I UNDERSTANDING BIG DATA 9

What is big data – why big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – Introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics

UNIT II NOSQL DATA MANAGEMENT 9

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schemaless databases – materialized Views – distribution models – sharing – master-slave replication – peer-peer replication – Sharing and replication – consistency – relaxing consistency – version stamps – map-reduce – partitioning and combining – composing map-reduce calculations

UNIT III BASICS OF HADOOP 9

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface– data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures

UNIT IV MAPREDUCE APPLICATIONS 9

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats

UNIT V HADOOP RELATED TOOLS 9

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis.Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Explain big data and use cases from selected business domains. (Understand)
- Explain NoSQL big data management. (Understand)
- Analyze, Install, configure, and run Hadoop and HDFS. (Analyze)
- Perform map-reduce analytics using Hadoop.(Analyze)
- Apply hadoop related tools such as Hbase, cassandra, pig, and hive for big data analytics.(Apply)

REFERENCES:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.
4. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
5. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
6. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
7. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
8. Alan Gates, "Programming Pig", O'Reilley, 2011.

15PCS515 **ENTERPRISE APPLICATION INTEGRATION** **L T P C**

3 0 0 3

OBJECTIVES :

- To explain approaches to enterprise application integration
- Give Knowledge on the integration middleware Architecture
- To familiarize students about the integration approaches suitable for a given problem

UNIT I INTRODUCTION 6

Requirements for EAI -Challenges in EAI – Integration with legacy systems – Integration with partners -Heterogeneous environment – Implementation approaches – Web services, messaging, ETL, direct data integration – Middleware requirements – Approaches to integration – services oriented and messaging

UNIT II INTEGRATION PATTERNS 6

Introduction to integration patterns – Architecture for application integration – Integration patterns – Point to point, broker, message bus, publish/subscribe, Challenges in performance, security, reliability -Case studies

UNIT III SERVICE ORIENTED INTEGRATION 12

Business process integration -Composite applications-services – Web services – Service choreography and orchestration -Business process modeling -BPMN, Business process execution -BPEL – Middleware infrastructure -Case studies

UNIT IV MESSAGING BASED INTEGRATION 9

Messaging – Synchronous and asynchronous – Message structure – Message oriented middleware – Reliability mechanisms – Challenges – Messaging infrastructure – Java Messaging Services – Case studies

UNIT V ENTERPRISE SERVICE BUS 12

Enterprise Service Bus – routing, scalable connectivity, protocol and message transformations, data enrichment, distribution, correlation, monitoring – Deployment configurations – Global ESB, Directly connected, Federated, brokered ESBs – Application server based – Messaging system based – Hardware based ESBs – Support to SOA, message based and event based integrations -Case studies.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Describe different approaches to integration enterprise applications (Remember)
- Analyze specifications and identify appropriate integration approaches (Analyze)
- Develop a suitable integration design for a given problem (Evaluate)
- Identify appropriate integration middleware for a given problem (Understand)
- Evaluate the integration approaches against specified requirements (Create)

REFERENCES:

1. George Mentzas and Andreas Frezen (Eds), "Semantic Enterprise Application Integration for Business Processes: Service-oriented Frameworks", Business Science Reference, 2009
2. Waseem Roshen, "SOA Based Enterprise Integration", Tata McGrawHill, 2009.
3. G. Hohpe and B.Woolf, "Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions", Addison Wesley Professional, 2003
4. D.Linthicum, "Next Generation Application Integration: From Simple Information to Web Services", Addison Wesley, 2003
5. Martin Fowler, "Patterns of Enterprise Application Architecture", Addison-Wesley, 2003
6. Kapil Pant and Matiaz Juric, "Business Process Driven SOA using BPMN and BPEL: From Business Process Modeling to Orchestration and Service Oriented Architecture", Packt Publishing, 2008

15PCS516	4G MOBILE TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To give an idea about various generations of wireless and cellular networks
- To familiarize students about fundamentals of 3G Services, its protocols and applications
- To give knowledge in evolution of 4G Networks, its architecture and applications

UNIT I INTRODUCTION 9

Introduction: History of mobile cellular systems, First Generation, Second Generation, Generation 2.5,Overview of 3G & 4G, 3GPP and 3GPP2 standards.

UNIT II 3G NETWORKS 9

3G Networks: Evolution from GSM, 3G Services & Applications, UMTS network structure, Core network, UMTS Radio access, HSPA – HSUPA, HSDPA, CDMA 1X , EV-DO Rev 0, Rev A, Rev B, Rev-C Architecture, protocol stack.

UNIT III 4G LTE NETWORKS 9

4G Vision, 4G features and challenges, Applications of 4G, 4G Technologies – Multi carrier modulation, Smart Antenna Techniques, OFDM-MIMO Systems, Adaptive Modulation and Coding with Time-Slot Scheduler, Bell Labs Layered Space Time (BLAST) System, Software-Defined Radio, Cognitive Radio.

UNIT IV WiMAX NETWORKS 9

WiMax: Introduction – IEEE 802.16, OFDM, MIMO, IEEE 802.20.

UNIT V 4G SECURITY 9

4G security issues-Interference-Scrambling attacks-Signal Jamming-Location Tracking-Key management issues-Denial of Service attacks-Open nature.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Outline the fundamental concepts of 4G Technologies (understand)
- Illustrate 3G/4G and WiMAX networks and its architecture (Remember)
- Identify suitable protocols for implementation of 4G networks (Apply)
- Evaluate the performance of 4G networks technologies (Analyze)
- Determine the impact of security threats in 4G (Evaluate)

REFERENCES:

1. Juha Korhonen, “Introduction to 3G Mobile Communication”, Artech House,(www.artechhouse.com), Jan 2003, ISBN-10: 1580535070
2. , Erik Dahlman, Stefan Parkvall, Johan Skold, “4G LTE/LTE – Advanced for Mobile Broadband” ,Academic Press 2011.
3. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, “3G Evolution HSPA and LTE for Mobile Broadband”, Academic Press, Oct 2008, ISBN-10: 0123745381
4. Flavio Muratore, UMTS Mobile Communication for the Future, John Wiley & Sons Ltd, Jan 2001,
5. N. Bikos and Nicolas Sklavos, "LTE/SAE Security Issues on 4G Wireless Networks", IEEE Security & Privacy, vol.11, no. 2, pp. 55-62, March-April 2013

15PCS517	CLOUD APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce the design issues in cloud based application development
- To impart knowledge on cloud application development
- To make the students implement a cloud based application

UNIT I DESIGNING CLOUD BASED APPLICATIONS 9

Role of business analyst, requirements gathering, UML, use of state diagrams, wire frame prototypes, use of design tools such as Balsamiq. Selecting front end technologies and standards, Impact of growth in mobile computing on functional design and technology decisions.

UNIT II ARCHITECTURAL CONSIDERATIONS 9

Concurrency, speed and unpredictable loads. Agile development, team composition, working with changing requirements and aggressive schedules. Understanding Model View Controller (MVC); Advanced Ajax and JQuery. Presenting to different browsers and devices. Localization and internationalization; Understanding client location and device type. Mobile application development – Android, iOS, WP, RIM, Symbian.

UNIT III STORING OBJECTS IN THE CLOUD 9

Session management. Advanced database techniques using MySQL and SQL Server, blob storage, table storage; Working with Third Party APIs: Overview of interconnectivity in cloud ecosystems. Working with Twitter API, Flickr API, Google Maps API. Advanced use of JSON and REST.

UNIT IV BEST PRACTICE CLOUD IT MODEL 9

Best Practice Cloud IT Model: Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development platform deployment so as to improve the total cost of ownership (TCO)

UNIT V APPLICATION DEVELOPMENT 9

Service creation environments to develop cloud based applications. Development environments for service development; Amazon, Azure, Google App- Case Study.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Understand the design issues of cloud software solutions (Understand)
- Apply architectural considerations in development of cloud applications (Apply)
- Research and critique a topic related to Software development in the cloud (Analyze)
- Analyze a real world problem and develop a cloud based software solution (Create)
- Understand various cloud application development nvironment(Understand)

REFERENCES:

1. Jim Webber, Savas Parastatidis, Ian Robinson,``REST in Practice", [ISBN: 978-0596805821]
2. Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, MatiasWoloski, "Developing Applications for the Cloud on the Microsoft Windows Azure Platform" [ISBN: 9780735656062]
3. Dan Wellman, jQuery UI 1.6 [ISBN: 9781847195128]
4. Peter Lubbers, Brian Albers, Frank Salem, Ric Smith, "Pro HTML5 Programming" [ISBN: 9781430227908]

5. Lee Babin, “Beginning Ajax with PHP” [ISBN: 9781590596678]
6. Richard York 2009, “Beginning JavaScript and CSS development with jQuery”, Wiley Pub. Indianapolis, IN [ISBN: 9780470227794]
7. Edward Benson 2008, “The art of Rails”, Wiley Pub. Indianapolis, IN [ISBN: 9780470189481]

15PCS524/ 15PNE502	VIDEO ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To familiarize the students the fundamental concepts of big data and analytics
- To provide an understanding of various techniques for mining data streams & Event Modeling for different applications
- To explain the knowledge of extracting information from surveillance videos.

UNIT I INTRODUCTION TO BIG DATA & DATA ANALYSIS 9

Introduction to Big Data Platform – Challenges of Conventional systems – Web data- Evolution of Analytic scalability- analytic processes and tools- Analysis Vs Reporting- Modern data analytic tools- Data Analysis: Regression Modeling- Bayesian Modeling- Rule induction.

UNIT II MINING DATA STREAMS 9

Introduction to Stream concepts- Stream data model and architecture – Stream Computing-Sampling data in a Stream- Filtering Streams- Counting distinct elements in a Stream- Estimating moments- Counting oneness in a window- Decaying window- Real time Analytics platform(RTAP) applications- case studies.

UNIT III VIDEO ANALYTICS 9

Introduction- Video Basics - Fundamentals for Video Surveillance- Scene Artifacts- Object Detection and Tracking: Adaptive Background Modeling and Subtraction- Pedestrian Detection and Tracking- Vehicle Detection and Tracking- Articulated Human Motion Tracking in Low-Dimensional Latent Spaces.

UNIT IV BEHAVIOURAL ANALYSIS & ACTIVITY RECOGNITION 9

Event Modeling- Behavioral Analysis- Human Activity Recognition-Complex Activity Recognition- Activity modeling using 3D shape, Video summarization, shape based activity models- Suspicious Activity Detection.

UNIT V HUMAN FACE RECOGNITION & GAIT ANALYSIS 9

Introduction: Overview of Recognition algorithms – Human Recognition using Face: Face Recognition from still images, Face Recognition from video, Evaluation of Face Recognition Technologies- Human Recognition using gait: HMM Framework for Gait Recognition, View Invariant Gait Recognition, Role of Shape and Dynamics in Gait Recognition.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Describe big data platform and its analysis techniques. (Remember)
- Identify efficient algorithms for mining the data from large volumes. (Understand)
- Analyze the surveillance videos for analytics. (Analyze)
- Introduce optimization algorithms for better analysis and recognition of objects in a scene. (Create)
- Explain recognition algorithms, face recognition technologies. (Understand)

REFERENCES:

1. Michael Berthold, David J.Hand, Intelligent Data Analysis, Springer, 2007.

2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
3. Yunqian Ma, Gang Qian, “Intelligent Video Surveillance: Systems and Technology”, CRC Press (Taylor and Francis Group), 2009.
4. Rama Chellappa, Amit K.Roy-Chowdhury, Kevin Zhou.S, “Recognition of Humans and their Activities using Video”, Morgan&Claypool Publishers, 2005.

15PCS525/
15PNE512 **NETWORK PROTOCOLS** **L T P C**

3 0 0 3

OBJECTIVES :

- To introduce the existing network architecture models and analyze the their performance
- To summarize the high speed network protocols and design issues.
- To explain network security technologies and protocols

UNIT I FUNDAMENTALS OF NETWORKING STANDARDS AND PROTOCOLS 9

Network Communication Architecture and Protocols -OSI Network Architecture seven Layers Model - Definition and Overview of TCP/IP Protocols -TCP/IP Four Layers Architecture Model -Other Network Architecture Models: IBM SNA.

UNIT II ROUTED AND ROUTING PROTOCOLS 9

Application Layer Protocols-Presentation Layer Protocols-Session Layer Protocols -Transport Layer Protocols -Network Layer Protocols -Data Link Layer Protocols -Routing Protocols – Multicasting Protocols -MPLS.

UNIT III ISDN AND NETWORK MANAGEMENT PROTOCOLS 9

Overview of ISDN − Channels − User access – Protocols Network management requirements − Network monitoring − Network control −SNMP V1, V2 and V3 − Concepts, MIBs − Implementation issues-RMON.

UNIT IV SECURITY AND TELEPHONY PROTOCOLS 9

Network Security Technologies and Protocols -AAA Protocols – Tunnelling Protocols – Security Protocols-Private key encryption − Data encryption system, public key encryption − RSA − Elliptic curve cryptography − Authentication mechanisms− Web security -Secured Routing Protocols – IP telephony -Voice over IP and VOIP Protocols –Signalling Protocols-Media/CODEC.

UNIT V NETWORK ENVIRONMENTS AND PROTOCOLS 9

Wide Area Network and WAN Protocols -Frame relay -ATM – Broadband Access Protocols –PPP Protocols -Local Area Network and LAN Protocols Ethernet Protocols -Virtual LAN Protocols Wireless LAN Protocols –Metropolitan Area Network and MAN Protocol -Storage Area Network and SAN Protocols.

TOTAL: 45 Periods

COURSE OUTCOMES:

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

- Describe the networking architectures and protocols in various levels.(understand)
- Illustrate the implementation issues in network management, monitoring and control.(Analyze)
- Identify the network security technologies & protocols. (Analyze)
- Analyze and design seven layers of protocols of wired and wireless networks. (Analyze)
- Describe various protocols in wireless LAN, MAN(Remember)

REFERENCES:

1. Javvin, “Network Protocols” ,Javvin Technologies Inc ,second edition, 2005
2. William Stallings, “Cryptography and Network Security”, PHI, 2000.
3. Mani Subramanian, “Network Management−Principles and Practices”, Addison

Wesley, 2000.
4. William Stallings, “SNMP, SNMPV2, SNMPV3 and RMON1 and 2”, 3rd Edition, Addison Wesley, 1999.
5. William Stallings, “Data and Computer Communications” 5th Edition, PHI, 1997.

15PCS526/ 15PNE514	SOCIAL NETWORK ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To familiarize the students the components of the social network
- To impart knowledge on the modeling and visualization of social network
- To give an idea about mining communities, evolution and opinion mining

UNIT I INTRODUCTION 9

Introduction to Web -Limitations of current Web – Development of Semantic Web -Emergence of the Social Web – Statistical Properties of Social Networks -Network analysis -Development of Social Network Analysis -Key concepts and measures in network analysis -Discussion networks -Blogs and online communities -Web-based networks.

UNIT II MODELING AND VISUALIZATION 9

Visualizing Online Social Networks -A Taxonomy of Visualizations -Graph Representation Centrality-Clustering -Node-Edge Diagrams -Visualizing Social Networks with Matrix Based Representations -Node-Link Diagrams -Hybrid Representations -Modelling and aggregating social network data -Random Walks and their Applications -Use of Hadoop and Map Reduce -Ontological representation of social individuals and relationships.

UNIT III MINING COMMUNITIES 9

Aggregating and reasoning with social network data, Advanced Representations – Extracting evolution of Web Community from a Series of Web Archive -Detecting Communities in Social Networks -Evaluating Communities -Core Methods for Community Detection & Mining Applications of Community Mining Algorithms -Node Classification in Social Networks.

UNIT IV EVOLUTION 9

Evolution in Social Networks -Framework -Tracing Smoothly Evolving Communities -Models and Algorithms for Social Influence Analysis -Influence Related Statistics -Social Similarity and Influence -Influence Maximization in Viral Marketing -Algorithms and Systems for Expert Location in Social Networks -Expert Location without Graph Constraints -with Score Propagation -Expert Team Formation -Link Prediction in Social Networks -Feature based Link Prediction -Bayesian Probabilistic Models -Probabilistic Relational Models.

UNIT V TEXT AND OPINION MINING 9

Text Mining in Social Networks -Opinion extraction -Sentiment classification and clustering Temporal sentiment analysis -Irony detection in opinion mining -Wish analysis -Product review mining -Review Classification – Tracking sentiments towards topics over time.

TOTAL: 45 Periods

COURSE OUTCOMES:

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

- Describe the fundamentals of social network (Understand)
- Model and visualize the social network (Analyze)
- Identify the behavior of the users in the social network (Knowledge)
- Discuss the evolution in social networks. (Understand)
- Point out the opinion of the user. (Analyze)

REFERENCES:

1. Charu C.Aggarwal, “Social Network Data Analytics”, Springer;2011
2. PeterMika, “Social Networks and theSemantic Web”, Springer, 1stedition, 2007.
3. Borko Furht, “Handbook of Social Network Technologies and Applications” ,Springer, 1st edition, 2010.
4. Guandong Xu , Yanchun Zhang and Lin Li, “Web Mining and Social Networking - Techniques and applications”, Springer, 1st edition, 2011.
5. Giles, Mark Smith, John Yen, “Advances in Social Network Mining and Analysis”, Springer, 2010.
6. Ajith Abraham,AboulElla Hassanien,Václav Snášel, “Computational Social Network Analysis: Trends, Tools and Research Advances”, Springer, 2009.
7. TobySegaran, “Programming Collective Intelligence”,O‟Reilly, 2012

15PCS527/ 15PNE517	INFORMATION SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To outline security in computer and network
- To impart knowledge on cryptographic algorithms used to provide confidentiality, integrity and authenticity
- .To introduce the students the noncryptographic implementation of polices in a system.

UNIT I INTRODUCTION 9

An Overview of Computer Security -Security Services -Security Mechanisms -Security Attacks - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies.

UNIT II CRYPTOSYSTEMS & AUTHENTICATION 9

Classical Cryptography -Substitution Ciphers -permutation Ciphers -Block Ciphers – DES -Modes of Operation – AES -Linear Cryptanalysis, Differential Cryptanalysis -Hash Function -SHA 512 Message Authentication Codes – HMAC -Authentication Protocols.

UNIT III PUBLIC KEY CRYPTOSYSTEMS 9

Introduction to Public key Cryptography -Number theory -The RSA Cryptosystem and Factoring Integer -Attacks on RSA -The ELGamal Cryptosystem -Digital Signature Algorithm -Finite Fields - Elliptic Curves Cryptography -Key management -Session and Interchange keys, Key exchange and generation – PKI .

UNIT IV SYSTEM 9

Design Principles, Representing Identity, Access Control Mechanisms, Information Flow and Confinement Problem .

UNIT V NETWORK SECURITY 9

Secret Sharing Schemes – Kerberos -Pretty Good Privacy (PGP) -Secure Socket Layer (SSL) - Intruders – HIDS -NIDS -Firewalls -Viruses

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Understand security policy and its various types.
- Explain cryptographic primitives used in authentication.
- Explain public key cryptography and key management
- Illustrate non cryptographic system implementation
- Describe the concepts that contribute to security implementation in a network

REFERENCES:

1. William Stallings, “Cryptography and Network Security: Principles and Practices”, Third Edition, Pearson Education, 2006.
2. Matt Bishop ,“Computer Security art and science ”, Second Edition, Pearson Education, 2002
3. Wade Trappe and Lawrence C. Washington, “Introduction to Cryptography with Coding Theory” Second Edition, Pearson Education, 2007
4. Jonathan Katz and YehudaLindell, “Introduction to Modern Cryptography ”,CRC Press,2007

5. Douglas R. Stinson, “Cryptography Theory and Practice”, Third Edition, Chapman & Hall/CRC, 2006
6. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, First Edition, 2006.

15PCS528/ 15PNE518 **TCP/IP DESIGN AND IMPLEMENTATION**

L	T	P	C
3	0	0	3

OBJECTIVES :

- To provide an understanding of the basic concepts of internet protocol.
- To familiarize the concept of IP switching and traffic engineering.
- To explain the fundamental concepts of IPv6.

UNIT I **INTRODUCTION** **9**

Network architecture-Standards and underlying technologies-Internet addressing-ARP -RARP-BOOTP-DHCP.

UNIT II **INTERNET PROTOCOL** **9**

IP Datagram-IP Package-IP forwarding and routing algorithms-computing paths-RIP-OSPF-ICMPIGMP.

UNIT III **TCP** **9**

TCP header-services-Connection establishment and termination -Interactive data flow -Bulk data flow – Flow control and Retransmission -TCP timers -Urgent Data processing– Congestion control – Extension headers.

UNIT IV **IP SWITCHING AND TRAFFIC ENGINEERING** **9**

Switching technology-MPLS fundamentals – signaling protocols – LDP – IP traffic engineering – ECMP – SBR – Routing extensions for traffic engineering – Traffic engineering limitations and future developments.

UNIT V **IPV6** **9**

IP security protocol-IPv6 addresses –Packet format-Multicast-Anycast-ICMPv6-Interoperation between IPv4 and IPv6-QoS –Auto configuration.

TOTAL: 45 Periods

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

- Analyze the architecture of TCP/IP (Analyze).
- Explain IP routing and forwarding (Understand).
- Illustrate TCP message format and congestion control (Analyze).
- Discuss the fundamentals of switching technologies (Understand).
- Design and explain IP Security protocol (Create)

REFERENCES:

1. Douglas E. Comer," Internetworking with TCP/IP Principles, Protocols, and Architecture"-5th edition Volume-1, Prentice Hall-2006.
2. Adrian Farrel," The Internet and its Protocols-A Comparative approach" Morgan Kaufmann, 2004.
3. W.Richard Stevens "TCP/IP Illustrated, The Protocols". Volume I, Pearson Education India 2003.
4. Behrouz A.Forouzan,"TCP/IPProtocolSuite"-3rd edition-Tata McGraw Hill-2006.
5. Pete Loshin"IPv6 Theory, Protocol and Practice, 2nd edition", Morgon Kaufmann-December-2003.
6. Comer D.E& Stevens D.L "Internetworking TCP/IP-Volume III",Prentice Hall of India –1997.

15PCS529/ 15PNE521	NEXT GENERATION NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To familiarize the students the technical, economic and service advantages of next generation networks.
- To explain the basic architecture of a next generation network (NGN) with reference
- To provide an understanding of NGN Management

UNIT I INTRODUCTION 9

Evolution of public mobile services -motivations for IP based services, Wireless IP network architecture – 3GPP packet data network architecture. Introduction to next generation networks - Changes, Opportunities and Challenges, Technologies, Networks, and Services, Next Generation Society, future Trends.

UNIT II IMS AND CONVERGENT MANAGEMENT 9

IMS Architecture -IMS services, QoS Control and Authentication, Network and Service management for NGN, IMS advantages, Next Generation OSS Architecture -standards important to OSS architecture, Information framework, OSS interaction with IMS, NGN OSS function/ information view reference model, DMTF CIM.

UNIT III MPLS AND VPN 9

Technology overview –MPLS & QoS, MPLS services and components – layer 2 VPN, layer 2 internetworking, VPN services, signaling, layer 3 VPN –Technology overview, Remote Access and IPsec integration with MPLS VPN.

UNIT IV MULTICAST 9

MPLS Multicast VPN overview – Applications, examples, IPv6 and MPLS -Technology overview, Future of MPLS –Integrating IP and optical networks, Future layer 3 services, future layer 2 services.

UNIT V NGN MANAGEMENT 9

Network Management and Provisioning – Configuration, Accounting, performance, security, case study for MPLS, Future enhancements – Adaptive self healing networks.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Design routing mechanism meeting the desired QoS in NGN. (Create)
- Design network management protocols in NGN. (Create)
- Explain the role of IP Multimedia Sub-system (IMS), network attachment and admission control functions. (Understand)
- Compare various methods of providing connection-oriented services over a NGN with reference to MPLS, MPLS-TE and T-MPLS. (Analyze)
- Compare various NGN virtual network services with reference to VPNs, VLANs, pseudo wires, VPLS and typical applications. (Analyze)

REFERENCES:

1. Thomas Plavyk, “Next generation Telecommunication Networks, Services and Management”, Wiley&IEEE Press Publications, 2012.
2. NeillWilkinson, “Next Generation Network Services”, John Wiley Publications, 2002.
3. Monique J.Morrow, “Next Generation Networks”, CISCO Press, 2007.

4. Robert Wood, “MPLS and Next Generation Networks: Foundations for NGN and Enterprise Virtualization", CISCO Press, 2006.
5. Ina Minie, Julian Lucek, “MPLS enabled Applications – Emerging developments and new technologies”, 3rd edition, Wiley. 2011.

15PCS518	PROTOCOLS AND ARCHITECTURE FOR WIRELESS SENSOR NETWORKS	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce the overview of Wireless Sensor Networks and its applications.
- To give knowledge on various architectures of WSN and methods involved in deploying and configuration of WSN.
- To explain various routing protocols, platforms and tools for WSN

UNIT I INTRODUCTION AND OVERVIEW OF WIRELESS SENSOR NETWORKS 9

Background of Sensor Network Technology, Application of Sensor Networks, Challenges for Wireless Sensor Networks, Mobile Adhoc Networks (MANETs) and Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

UNIT II ARCHITECTURES 9

Single-node Architecture, Hardware Components & Design Constraints, Operating Systems and Execution Environments, Introduction to Tiny OS and nesC, Network Architecture, Sensor Network Scenarios, Optimization Goals and Figures of Merit, Design Principles for WSNs, Service Interfaces of WSNs, Gateway Concepts.

UNIT III DEPLOYMENT AND CONFIGURATION 9

Localization and Positioning, Coverage and Connectivity, Single-hop and Multi-hop Localization, Self Configuring Localization Systems, Sensor Management Network Protocols: Issues in Designing MAC Protocol for WSNs, Classification of MAC Protocols, S-MAC Protocol, B-MAC Protocol, IEEE 802.15.4 Standard and Zig Bee, Dissemination Protocol for Large Sensor Network.

UNIT IV ROUTING PROTOCOLS AND DATA MANIPULATION 9

Issues in Designing Routing Protocols, Classification of Routing Protocols, Energy-Efficient Routing, Unicast, Broadcast and Multicast, Geographic Routing. Data Centric and Content based Routing, Storage and Retrieval in Network, Compression Technologies for WSN, Data Aggregation Technique

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level Software Platforms, Node-level Simulators, State-centric Programming.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Describe about wireless sensor networks.(understand)
- Explain the architecture of WSN.(Understand)
- Discuss various methods involved in deploying and configuring wireless sensors networks.(understand).
- Classify various routing protocol.(understand)
- Analyze networks using simulation tools.(Analysis)

REFERENCES:

1. Holger Karl&Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks", John Wiley, 2005
2. FengZhao &Leonidas J. Guibas, “Wireless Sensor Networks-An Information Processing Approach", Elsevier, 2007.
3. Raghavendra,CauligiS, Sivalingam,Krishna M., Zanti Taieb, “Wireless Sensor Network”, Springer 1stEd. 2004(ISBN:978-4020-7883-5).

4. Kazem Sohraby, DanielMinoli, &TaiebZnati, “Wireless Sensor Networks-Technology, Protocols, and Applications”,John Wiley, 2007.
5. N. P. Mahalik, “Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications” Springer Verlag.
6. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

15PCS519	LANGUAGE TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To understand the mathematical foundations and processing syntax needed for language processing.
- To understand different methods of disambiguating word senses and typical text categorization and clustering techniques.
- To learn the indexing and searching processes of a typical information retrieval system and to study NLP based retrieval systems.

UNIT I INTRODUCTION 9

Natural Language Processing – Mathematical Foundations – Elementary Probability Theory – Essential information Theory -Linguistics Essentials -Parts of Speech and Morphology – Phrase Structure – Semantics – Corpus Based Work.

UNIT II WORDS 9

Collocations – Statistical Inference – n-gram Models – Word Sense Disambiguation – Lexical Acquisition.

UNIT III GRAMMAR 9

Markov Models – Part-of-Speech Tagging – Probabilistic Context Free Grammars – Parsing

UNIT IV INFORMATION RETRIEVAL 9

Information Retrieval Architecture – Indexing -Storage – Compression Techniques – Retrieval Approaches – Evaluation -Search Engines -Commercial Search Engine Features – Comparison - Performance Measures – Document Processing -NLP based Information Retrieval – Information Extraction

UNIT V TEXT MINING 9

Categorization – Extraction Based Categorization – Clustering -Hierarchical Clustering Document Classification and Routing -Finding and Organizing Answers from Text Search – Text Categorization and Efficient Summarization using Lexical Chains – Machine Translation – Transfer Metaphor - Interlingual and Statistical Approaches

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Identify the different linguistic components of given sentences (Remember)
- Design a morphological analyser for a language of your choice using finite state automata concepts (Create)
- Discuss algorithms for word sense disambiguation (Understand)
- Build a tagger to semantically tag words using WordNet (Create)
- Design an application that uses different aspects of language processing. (Create)

REFERENCES:

1. Christopher D.Manning and HinrichSchutze, “Foundations of Statistical Natural Language Processing “, MITPress, 1999.
2. Daniel Jurafsky and James H.Martin, “Speech and Language Processing”, Pearson, 2008.
3. Ron Cole, J.Mariani, et.al “Survey of the State of the Art in Human Language Technology”, Cambridge University Press, 1997.
4. MichaelW. Berry, “Survey of Text Mining: Clustering, Classification and Retrieval”, Springer Verlag, 2003.

15PCS520	MULTI OBJECTIVE OPTIMIZATION TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To understand the fundamental principles of Multiobjective Optimization (MOP)
- To explain various design issues of MOP
- To familiarize Parallel and hybrid MOP Algorithms

UNIT I INTRODUCTION AND CLASSICAL APPROACHES 9

Multiobjective optimization: Introduction - Multiobjective optimization problem-principles –Difference between single and multiobjective optimization – Dominance and Pareto Optimality, Classical Methods – Weighted Sum – constraint method – Weighted Metric methods –Benson‟s method - Value Function – Goal Programming methods – Interactive Methods.

UNIT II MOP EVOLUTIONARY ALGORITHMS 9

Generic MOEA - Various MOEAs: MOGA, NSGA-II, NPGA, PAES, SPEA2, MOMGA, And micro GA - Constrained MOEAs: Penalty Function approach - Constrained Tournament – Ray– Tai –Seow‟s Method.

UNIT III THEORETICAL ISSUES 9

Fitness Landscapes - Fitness Functions - Pareto Ranking - Pareto Niching and Fitness Sharing - Recombination Operators - Mating Restriction - Solution Stability and Robustness – MOEA Complexity - MOEA Scalability - Running Time Analysis - MOEA Computational Cost - No Free Lunch Theorem.

UNIT IV MOEA TESTING, ANALYSIS, AND PARALLELIZATION 9

MOEA Experimental Measurements – MOEA Statistical Testing Approaches – MOEA Test Suites - MOEA Parallelization: Background – Paradigms – Issues - MOEA Local Search Techniques.

UNIT V APPLICATIONS AND ALTERNATIVE METAHEURISTICS 9

Scientific Applications: Computer Science and Computer Engineering – Alternative Metaheuristics: Simulated Annealing – Tabu Search and Scatter Search – Ant System –Distributed Reinforcement Learning – Particle Swarm Optimization – Differential Evolution –Artificial Immune Systems - Other Heuristics.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to:

- Explain MOP principles. (Understand)
- Analyze the constrained MOP problems.(Analyze)
- Explain parallelization of MOP algorithms. (Understand)
- Design parallel and hybrid MOP algorithms. (Create)
- Analyze of MOP algorithm results.(Analyze)

REFERENCES:

1. Carlos A. Coello Coello, Gary B. Lamont, David A. Van Veldhuizen, “Evolutionary Algorithms for Solving Multi-objective Problems”, Second Edition, Springer, 2007.
2. Kalyanmoy Deb, “ Multi-Objective Optimization Using Evolutionary Algorithms”, John Wiley, 2002.

3. Aimin Zhoua, Bo-Yang Qub, Hui Li c, Shi-Zheng Zhaob, Ponnuthurai Nagaratnam Suganthan b, Qingfu Zhangd, “Multiobjective evolutionary algorithms: A survey of the state of the art”, Swarm and Evolutionary Computation (2011) 32–49.
4. E Alba, M Tomassini, “Parallel and evolutionary algorithms”, Evolutionary Computation, IEEE Transactions on 6 (5), 443-462.
5. Crina Grosan, Ajith Abraham, “Hybrid Evolutionary Algorithms: Methodologies, Architectures, and Reviews”, Studies in Computational Intelligence, Vol. 75, Springer, 2007.
6. Christian Blum and Andrea Roli. 2003. Metaheuristics in combinatorial optimization: Overview and conceptual comparison. ACM Comput. Surv. 35, 3 (September 2003),268- 308.

15PCS521	MACHINE LEARNING	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To introduce linear and non-linear learning models
- To give an idea about distance-based clustering techniques and to build tree and rule based models
- To outline reinforcement learning techniques

UNIT I FOUNDATIONS OF LEARNING 9

Components of learning – learning models – geometric models – probabilistic models – logic models – grouping and grading – learning versus design – types of learning – supervised – unsupervised – reinforcement – theory of learning – feasibility of learning – error and noise – training versus testing – theory of generalization – generalization bound – approximation-generalization tradeoff – bias and variance – learning curve.

UNIT II LINEAR MODELS 9

Linear classification – univariate linear regression – multivariate linear regression – regularized regression – Logistic regression – perceptrons – multilayer neural networks – learning neural networks structures – support vector machines – soft margin SVM – going beyond linearity – generalization and over fitting – regularization – validation.

UNIT III DISTANCE-BASED MODELS 9

Nearest neighbor models – K-means – clustering around medoids – silhouttes – hierarchical clustering – k-d trees – locality sensitive hashing – non-parametric regression – ensemble learning – bagging and random forests – boosting – meta learning.

UNIT IV PROBABILISTIC GRAPHICAL MODEL 9

Decision trees – learning decision trees – ranking and probability estimation trees – regression trees – clustering trees – learning ordered rule lists – learning unordered rule lists– descriptive rule learning – association rule mining – first-order rule learning.

UNIT V ADVANCED LEARNING 9

Passive reinforcement learning – direct utility estimation – adaptive dynamic programming – temporal difference learning – active reinforcement learning – exploration – learning an action-utility function – Generalization in reinforcement learning – policy search – applications in game playing –applications in robot control.

TOTAL: 45 Periods

COURSE OUTCOMES:

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

- Explain theory underlying machine learning (Understand)
- Construct algorithms to learn linear and non-linear models(create)
- Compute data clustering algorithms(Apply)
- Define algorithms for tree and rule-based models(Remember)
- Apply reinforcement learning techniques(Apply)

REFERENCES:

1. Y. S. Abu-Mostafa, M. Magdon-Ismail, and H.-T. Lin, “Learning from Data”, AMLBook Publishers, 2012.
2. P. Flach,“Machine Learning: The art and science of algorithms that make sense of data”, Cambridge UniversityPress,2012.

3. K. P. Murphy, “Machine Learning:Aprobabilistic perspective”,MITPress, 2012.
4. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007.
5. D. Barber, “Bayesian Reasoning and Machine Learning”, Cambridge University Press, 2012.
6. M. Mohri, A. Rostamizadeh, andA. Talwalkar, “Foundations of Machine Learning”, MIT Press, 2012.
7. T. M. Mitchell, “Machine Learning”, McGraw Hill, 1997.
8. S. Russel and P. Norvig, “Artificial Intelligence:A Modern Approach ”,Third Edition, Prentice Hall, 2009

15PCS522	DATA MINING TECHNIQUES	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To familiarize students with Data mining principles and techniques and introduce Data mining as a edge business intelligence.
- To summarize Business applications and Trends of Data mining.
- To give an idea about Core topics like classification, clustering and association rules.

UNIT I INTRODUCTION TO DATA MINING 9

Introduction to Data Mining – Data Mining Tasks – Components of Data Mining Algorithms – Data Mining supporting Techniques – Major Issues in Data Mining – Measurement and Data
-Data Pre processing – Data sets.

UNIT II OVERVIEW OF DATA MINING ALGORITHMS 9

Overview of Data Mining Algorithms – Models and Patterns – Introduction – The Reductionist viewpoint on Data Mining Algorithms – Score function for Data Mining Algorithms-Introduction – Fundamentals of Modelling – Model Structures for Prediction – Models for probability Distributions and Density functions – The Curve of Dimensionality – Models for Structured Data – Scoring Patterns – Predictive versus Descriptive score functions – Scoring Models with Different Complexities – Evaluation of Models and Patterns – Robust Methods.

UNIT III CLASSIFICATIONS 9

Classifications – Basic Concepts – Decision Tree induction – Bayes Classification Methods
– Rule Based Classification – Model Evaluation and Selection – Techniques to Improve Classification Accuracy – Classification: Advanced concepts – Bayesian Belief Networks-Classification by Back Propagation – Support Vector Machine – Classification using frequent patterns.

UNIT IV CLUSTER ANALYSIS 9

Cluster Analysis: Basic concepts and Methods – Cluster Analysis – Partitioning methods – Hierarchical methods – Density Based Methods – Grid Based Methods – Evaluation of Clustering – Advanced Cluster Analysis: Probabilistic model based clustering – Clustering High – Dimensional Data – Clustering Graph and Network Data – Clustering with Constraints.

UNIT V ASSOCIATION RULE MINING AND VISUALIZATION 9

Association Rule Mining – Introduction – Large Item sets – Basic Algorithms – Parallel and Distributed Algorithms – Comparing Approaches – Incremental Rules – Advanced Association Rule Techniques – Measuring the Quality of Rules – Visualization of Multidimensional Data – Diagrams for Multidimensional visualization – Visual Data Mining – Data Mining Applications – Case Study: WEKA.

TOTAL: 45 Periods

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to:

- Illustrate Multidimensional Intelligent model from typical system (Understand)
- Express the concepts of database technology evolutionary path which has led to the need for data mining and its applications (Understand)
- Discover the knowledge imbibed in the high dimensional system (Understand)
- Identify various mining techniques on complex data objects (Analyze)
- Design data mining systems and solutions to meet user requirements (Create)

REFERENCES:

1. Jiawei Han, Micheline Kamber , Jian Pei, “Data Mining: Concepts and Techniques”,

Third Edition, The Morgan Kaufmann Series in Data Management Systems, 2012.
2. David J.Hand, HeikkiMannila and Padhraic Smyth “Principles of DataMining”, Adaptive Computation and Machine Learning, 2005
3. Margaret H Dunham, “Data Mining: Introductory and Advanced Topics”, 2003
4. Soman,K. P., Diwakar Shyam and Ajay V. “Insight into Data Mining: Theory And Practice”, PHI, 2009.

15PCS523	INDUSTRIAL AND SYSTEMS ENGINEERING IN HEALTHCARE	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To learn the basics of healthcare.
- To learn the tools and techniques in the evaluation of healthcare system
- To learn the recent developments in healthcare

UNIT I INTRODUCTION TO HEALTH CARE OPERATIONS 9

A systems look at health care – opportunities and challenges – Integrated framework for operations management – Evidence Based Medicine and Pay for Performance –Hospital business operations.

UNIT II PROCESS ENGINEERING AND OPTIMIZATION 9

Process and Quality Improvement - Optimizing patient and process flows – project and change management - Tools for problem solving and decision making – statistical tools for operations improvement – Six sigma in health care - Quality management and strategies for Process redesign – Workload analysis – Scheduling and capacity management in health care.

UNIT III PERFORMANCE MEASURES, TOOLS AND TECHNIQUES 9

Productivity metrics in healthcare - Mapping techniques – Value Stream mapping Analytical and statistical tools – Balanced score card in Healthcare – Optimization and simulation in healthcare.

UNIT IV LOGISTICS AND SUPPLY CHAIN MANAGEMENT 9

Supply chain management strategy – Purchasing and materials management –Inventory management and Accounting – Classifying and managing products - Pharmaceutical supply chain.

UNIT V RECENT DEVELOPMENTS 9

Healthcare Finance – Return on Investment Models – Project Management – ERP – Healthcare policy – Human factors in Healthcare – Telemedicine and emerging technologies.

TOTAL: 45 Periods

COURSE OUTCOMES:

After the successful completion of this course, the student will be able to

- Identify the needs, requirements and limitations of a health care system (Undertand)
- Evaluate health care system quality. (Evaluate)
- Model and improve health care system performance. (Analyze)
- Analyze the human resource problems involved in health care systems. (Analyze)
- Learn the recent developments in healthcare management (Understand)

REFERENCES:

1. Daniel B.McLaughlin, Julie M.Hays, ” . Healthcare Operations Management ”,HAP, Second Edition, , 2008.
2. R.Langabeer ” Healthcare Operations Management: A Quantitative Approach to Business and Logistics ”, Jones & Bartlett Publishers, First Edition, 2007.

OPEN ELECTIVE

15PCS607	MANAGEMENT INFORMATION SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES :

- To impart the fundamentals of Management Information System
- To make aware the various Management Information Systems and to review the role played by MIS in business environment
- To introduce the core activities in the systems development process
- To expose MIS subsystems and technologies including software, hardware and networking and also to know about the security issues and control mechanism
- To improve the knowledge of emerging trends of Management Information Systems

UNIT I INTRODUCTION 9

Data, Information, Intelligence, Information Technology, Information System, evolution, types based on functions and hierarchy, System Analyst – Role, Functions.

UNIT II SYSTEMS ANALYSIS AND DESIGN 9

SDLC, SSLC, Systems Analysis and System Design, Tools – DFD – ER – Object modeling, DBMS – RDBMS – OODBMS.

UNIT III TYPES OF INFORMATION SYSTEM 9

Financial, Marketing, Personnel, Production, Materials Information System, DSS, EIS,KMS, GIS, International Information System.

UNIT IV SECURITY AND CONTROL 9

Security, Testing, Error detection, Controls, IS Vulnerability, Computer Crimes, Securing the Web, Intranets and Wireless Networks, Software Audit, Ethics in IT.

UNIT V NEW IT INITIATIVES 9

E- business, E-governance, ERP, SCM, e-CRM, Data warehousing and Data Mining, Business Intelligence, Pervasive Computing, CMM.

TOTAL: 45 Periods

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to:

- Understand the roles of System analyst (Understand)
- Apply new techniques in system design (Apply)
- Analyze security issues in information systems (Analyze)
- Create information systems with tools (Create)

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6. Raymond McLeod and Jr. George P. Schell, "Management Information Systems", Pearson Education, 2007.
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