

**SNS COLLEGE OF TECHNOLOGY**

**(AN AUTONOMOUS INSTITUTION)**

**COIMBATORE - 641 035**

**REGULATION – 2016**

**CHOICE BASED CREDIT SYSTEM**

**SUGGESTED CURRICULA I – IV SEMESTERS**

**AND**

**SYLLABI I – IV SEMESTERS**

**M. TECH – INFORMATION TECHNOLOGY**

**SNS COLLEGE OF TECHNOLOGY, COIMBATORE – 641035****(AN AUTONOMOUS INSTITUTION)****REGULATION – 2016****CHOICE BASED CREDIT SYSTEM****SUGGESTED CURRICULA I – IV SEMESTERS****AND****SYLLABI I – IV SEMESTERS****M. TECH – INFORMATION TECHNOLOGY****SEMESTER I**

S.NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
<b>THEORY</b>									
1.	16MA601	Operations Research	FC	4	4	0	0	4	
2.	16IT601	Multi Core architecture	PC	5	3	2	0	4	
3.	16IT602	Advanced Data structures and Algorithms	PC	3	3	0	0	3	
4.	16CS603	Computer Networks and Management	PC	3	3	0	0	3	
5.		Professional Elective -I	PE	3	3	0	0	3	
6.		Professional elective -II	PE	3	3	0	0	3	
<b>PRACTICAL</b>									
7.	16IT603	Advanced Data Structures and Algorithms Laboratory	PC	4	0	0	4	2	
8.	16CS606	Networking Laboratory	PC	4	0	0	4	2	
<b>TOTAL</b>				<b>29</b>				<b>24</b>	

**SEMESTER II**

S.NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
<b>THEORY</b>									
1.	16IT604	Internet Programming	PC	3	3	0	0	3	
2.	16IT605	Advanced Database Technology	PC	3	3	0	0	3	
3.	16IT606	Distributed Operating System	PC	3	3	0	0	3	
4.		Professional elective –III	PE	3	3	0	0	3	
5.		Professional elective –IV	PE	3	3	0	0	3	
<b>PRACTICAL</b>									
6.	16IT607	Internet Programming Laboratory	PC	4	0	0	4	2	

7.	16IT608	Distributed Operating System Laboratory	PC	4	0	0	4	2	
8.	16IT609	Technical Seminar	EEC	4	0	0	4	2	
<b>TOTAL</b>				<b>27</b>				<b>21</b>	

### SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
<b>THEORY</b>									
1.		Professional elective -V	PE	3	3	0	0	3	
2.		Open elective -I	OE	3	3	0	0	3	
<b>PRACTICAL</b>									
3.	16IT701	Project Phase -I	EEC	12	0	0	12	6	
<b>TOTAL</b>				<b>18</b>				<b>12</b>	

### SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	CAT	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
<b>THEORY</b>									
1.	16IT702	Project Phase -II	EEC	24	0	0	24	12	
<b>TOTAL</b>				<b>24</b>				<b>12</b>	

### FOUNDATIONAL COURSE

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16MA601	Operations Research	4	4	0	0	4	

### PROFESSIONAL CORE (PC)

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16IT601	Multi Core architecture	5	3	2	0	4	
2.	16IT602	Advanced Data structures and Algorithms	3	3	0	0	3	
	16IT603	Advanced Data Structures and Algorithms Laboratory	4	0	0	4	2	
3.	16CS603	Computer Networks and Management	3	3	0	0	3	
4.	16IT604	Internet Programming	3	3	0	0	3	
5.	16IT605	Advanced Database Technology	3	3	0	0	3	
6.	16IT606	Distributed Operating System	3	3	0	0	3	

7.	16CS606	Networking Laboratory	4	0	0	4	2	
8.	16IT607	Internet Programming Laboratory	4	0	0	4	2	
9.	16IT608	Distributed Operating System Laboratory	4	0	0	4	2	

### PROFESSIONAL ELECTIVES

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1	16IT610	Pervasive Computing	3	3	0	0	3	
2	16IT611	Cloud Computing	3	3	0	0	3	
3	16IT612	Wireless Ad hoc and Sensor Networks	3	3	0	0	3	
4	16IT613	4G Technologies	3	3	0	0	3	
5	16IT614	Cryptography and Network security	3	3	0	0	3	
6	16IT615	Software Quality and Testing	3	3	0	0	3	
7	16IT616	Multimedia Database	3	3	0	0	3	
8	16IT617	Embedded Systems	3	3	0	0	3	
9	16CS720	Big Data Analytics	3	3	0	0	3	
10	16IT619	Artificial Intelligence	3	3	0	0	3	
11	16IT620	Information System Design	3	3	0	0	3	
12	16IT621	Component Based Technology	3	3	0	0	3	
13	16IT703	Virtualization Techniques	3	3	0	0	3	
14	16IT704	Object Oriented Software Design	3	3	0	0	3	
15	16IT705	Enterprise Resource Planning	3	3	0	0	3	
16	16IT706	Mobile Communication	3	3	0	0	3	
17	16CS617	Agent Based Intelligent Systems	3	3	0	0	3	
18	16CS614	Bioinformatics	3	3	0	0	3	
19	16SW605	Software Project Management	3	3	0	0	3	
20	16CS620	Cyber Forensics and Information Security	3	3	0	0	3	
21	16CS712	Distributed Computing	3	3	0	0	3	
22	16CS619	Data Warehousing and Data Mining	3	3	0	0	3	
23	16CS707	Soft computing	3	3	0	0	3	
24	16CS609	Internet of Things	3	3	0	0	3	

### EMPLOYABILITY ENHANCEMENT COURSES (EEC)

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16IT609	Technical Seminar	4	0	0	4	2	-
2.	16IT701	Project Phase –I	12	0	0	12	6	-
3.	16IT702	Project Phase –II	24	0	0	24	12	16IT701

### OPEN ELECTIVE OFFERED TO OTHER PG PROGRAMMES

S.NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C	PRE-REQUISITES
1.	16IT901	Green Computing	3	3	0	0	3	-
2.	16IT902	Network on Chip	3	3	0	0	3	-
3.	16IT903	Cloud computing paradigm	3	3	0	0	3	-
4.	16IT904	Web Designing	3	3	0	0	3	-
5.	16IT905	Python Programming	3	3	0	0	3	-

S.No.	SUBJECT AREA	Credits Per Semester				Total Credits
		I	II	III	IV	
1	FC	4				4
2	PC	14	13			27
3	PE	6	6	3		15
4	OE			3		3
4	EEC		2	6	12	20
	<b>TOTAL</b>	<b>24</b>	<b>21</b>	<b>12</b>	<b>12</b>	<b>69</b>

<b>16MA601</b>	<b>OPERATIONS RESEARCH</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

<b>UNIT-I</b>	<b>QUEUEING MODELS</b>	<b>12</b>
Poisson Process – Markovian Queues – Single and Multi-server Models – Little’s formula – Machine Interference Model – Steady State analysis – Self Service Queue.		

<b>UNIT-II</b>	<b>ADVANCED QUEUEING MODEL</b>	<b>12</b>
Non- Markovian Queues – Pollaczek Khintchine Formula – Queues in Series – Open Queueing Networks –Closed Queueing networks.		

<b>UNIT-III</b>	<b>NETWORK MODELS</b>	<b>12</b>
Network Construction- computation of earliest start time, latest start time, Total, free and independent float time- Computation of optimistic, most likely Pessimistic and expected time.		

<b>UNIT-IV</b>	<b>LINEAR PROGRAMMING</b>	<b>12</b>
Formulation – Graphical solution – Simplex method – Two phase method - Transportation and Assignment Problems.		

<b>UNIT-V</b>	<b>NON-LINEAR PROGRAMMING</b>	<b>12</b>
Lagrange multipliers – Equality constraints – Inequality constraints – Kuhn - Tucker conditions – Quadratic Programming.		

<b>L:60 T:0 TOTAL : 60 PERIODS</b>
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<b>REFERENCES</b>
<ol style="list-style-type: none"> <li>1. Nita H.Shah., Ravi M. Gor and Hardik Soni, Operations Research, Prentice Hall India, 2008</li> <li>2. Ross. S.M., Introduction to Probability Models, 10<sup>th</sup> Edition,Academic Press, 2010</li> <li>3. Donald Gross and Carl M. Harris, Fundamentals of Queueing theory, 3rd edition, John Wiley and Sons, New York (2011 Reprint)</li> <li>4. Sankara Iyer P, Operations Research, Tata Mcgraw Hill, 2008</li> <li>5. Taha, H.A. Operations Research: An Introduction, Ninth Edition, Pearson Education Edition, Asia, New Delhi, 2011</li> </ol>

<b>16IT601</b>	<b>MULTI-CORE ARCHITECTURE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>

<b>UNIT I</b>	<b>NEED FOR MULTICORE ARCHITECTURES</b>	<b>9+6</b>
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.		

<b>UNIT II</b>	<b>MULTIPROCESSOR ISSUES</b>	<b>9+6</b>
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		

<b>UNIT III</b>	<b>MULTICORE ARCHITECTURES</b>	<b>9+6</b>
Homogeneous and Heterogeneous Architectures – Intel Multicore Architectures – SUN CMP architecture – IBM Cell Architecture – GPGPU Architectures		

<b>UNIT IV</b>	<b>MEMORY HIERARCHY DESIGN</b>	<b>9+6</b>
Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies		

<b>UNIT V</b>	<b>MULTICORE PROGRAMMING</b>	<b>9+6</b>
Parallel Programming models – Shared Memory Programming – Message Passing Interface – Open MP Program Development and Performance Tuning		

<b>L:45 T:30</b>	<b>TOTAL : 75 PERIODS</b>
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<b>REFERENCES</b>	
1.	John L. Hennessey and David A. 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.	David E. Culler, Jaswinder Pal Singh, “Parallel Computing Architecture : A Hardware/ Software Approach” , Morgan Kaufmann / Elsevier, 1997

<b>WEB RESOURCES</b>
1. <a href="http://www.cs.cmu.edu/~fp/courses/15213-s07/lectures/27-multicore.pdf">www.cs.cmu.edu/~fp/courses/15213-s07/lectures/27-multicore.pdf</a>
2. <a href="https://software.intel.com/en.../multi-core-processor-architecture-explaine">https://software.intel.com/en.../multi-core-processor-architecture-explaine</a>
3. <a href="http://biogrid.engr.uconn.edu/REU/Presentations_10/Rifat.pdf">biogrid.engr.uconn.edu/REU/Presentations_10/Rifat.pdf</a>
4. <a href="http://accel.cs.vt.edu/files/lecture2.pdf">accel.cs.vt.edu/files/lecture2.pdf</a>
5. <a href="http://www.springer.com/cda/content/.../cda.../9781441997388-c2.pdf?">www.springer.com/cda/content/.../cda.../9781441997388-c2.pdf?</a>

<b>16IT602</b>	<b>ADVANCED DATA STRUCTURES AND ALGORITHMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>	<b>FUNDAMENTALS</b>				<b>9</b>
Mathematical Proof Techniques: Induction, proof by contradiction, direct proofs - Asymptotic Notations – Properties of Big-oh Notation –Conditional Asymptotic Notation – Algorithm Analysis – Amortized Analysis – Introduction to NP-Completeness/NP-Hard – Recurrence Equations – Solving Recurrence Equations – Time-Space Tradeoff.					

<b>UNIT II</b>	<b>HEAP STRUCTURES</b>				<b>9</b>
Min/Max heaps – Deaps – Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps – Lazy Binomial Heaps.					

<b>UNIT III</b>	<b>SEARCH STRUCTURES</b>				<b>9</b>
Binary Search Trees – AVL Trees – Red-Black trees – Multi-way Search Trees –B +Trees – SplayTrees – Tries					

<b>UNIT IV</b>	<b>GEOMETRIC ALGORITHMS</b>				<b>9</b>
Segment Trees – 1-Dimensional Range Searching - k-d Trees – Line Segment Intersection – Convex Hulls - Computing the Overlay of Two Subdivisions - Range Trees - Voronoi Diagram					

<b>UNIT V</b>	<b>PARALLEL ALGORITHMS</b>				<b>9</b>
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					

<b>L:45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	E. Horowitz, S. Sahni and Dinesh Mehta, Fundamentals of Data structures in C++, University Press, 2007
2.	G. Brassard and P. Bratley, Algorithmics: Theory and Practice, Printice –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 Data Structures and Algorithms, Springer, New York, 2002



<b>WEB RESOURCES</b>
1. <a href="https://graphics.stanford.edu/courses/cs468.../02%20vladlen%20notes.pdf">https://graphics.stanford.edu/courses/cs468.../02%20vladlen%20notes.pdf</a>
2. <a href="http://cs-fundamentals.com/data-structures/introduction-to-data-structures.php">cs-fundamentals.com/data-structures/introduction-to-data-structures.php</a>
3. <a href="http://www.cs.cmu.edu/~ckingsf/class/15351/">www.cs.cmu.edu/~ckingsf/class/15351/</a>
4. <a href="http://cs-fundamentals.com/data-structures/introduction-to-data-structures.php">cs-fundamentals.com/data-structures/introduction-to-data-structures.php</a>
5. <a href="http://www.cs.tut.fi/~elomaa/teach/72006">www.cs.tut.fi/~elomaa/teach/72006</a>

<b>16CS603</b>	<b>COMPUTER NETWORKS AND MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT-I</b>	<b>HIGH SPEED NETWORKS</b>	<b>9</b>
Introduction: Need for speed & quality of service, TCP & IP- Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM logical Connection, ATM Cell – ATM Service Categories – AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, Fiber Channel -Wireless LAN's: applications, requirements – Architecture of 802.11.		
<b>UNIT-II</b>	<b>CONGESTION AND TRAFFIC MANAGEMENT</b>	<b>9</b>
Queuing Analysis- Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks –Frame Relay Congestion Control- Link level Flow & error control.		

<b>UNIT-III</b>	<b>TCP AND ATM CONGESTION CONTROL</b>	<b>9</b>
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management –Exponential RTO backoff – KARN's Algorithm – Window management Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM Cell formats, ABR Capacity allocations.		
<b>UNIT-IV</b>	<b>INTEGRATED AND DIFFERENTIATED SERVICES</b>	<b>9</b>
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services.		
<b>UNIT-V</b>	<b>PROTOCOLS FOR QoS SUPPORT</b>	<b>9</b>
Interior Routing Protocols, Exterior Routing Protocols , RSVP – Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms –Multiprotocol Label Switching – Operations, Label Stacking, Protocol details – RTP – Protocol Architecture, Data Transfer Protocol, RTCP Challenges and research issues in high performance networks.		

<b>L:45</b>	<b>T:0</b>	<b>T: 45 PERIODS</b>
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<b>REFERENCES</b>
1. William Stallings, “High Speed Networks And Internet”, Pearson Education, Second Edition,

2002.(Unit-I,II,III,IV,V)

2. Warland & Pravin Varaiya, "High Performance Communication Networks", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001. (UNIT I , II)
3. Irvan Pepelnjk, Jim Guichard and Jeff Aparcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003. (UNIT IV)
4. High-speed networks: TCP/IP and ATM design principles by William Stallings, Ist Edition, Prentice hall, 1998. (UNIT III)
5. High Performance TCP/IP Networking: Concepts, issues and solutions: By Mahoob Hassan Raj and Jain PHI Publisher, 1998. (UNIT V)

16IT603	ADVANCED DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	4	2
<b>LIST OF EXPERIMENTS</b>					
1	Implementation of Min Heap & Max Heap.				
2	Implementation of Heaps.				
3	Implementation of Leftist Heap				
4	Implementation of AVL Tree.				
5	Implementation of B-Tree.				
6	Implementation of Tries.				
7	Implementation of Job Sequencing with Deadlines				
8	Implementation of 0/1 Knapsack using Dynamic Programming				
9	Implementation of Graph coloring using backtracking				
<b>P: 60 T:0 TOTAL : 60 PERIODS</b>					
<b>HARDWARE / SOFTWARE REQUIRED</b>					
<b>Hardware</b>	<ul style="list-style-type: none"> <li>• PCs</li> <li>• Processor-2.0 GHz or Higher</li> <li>• RAM-256 MB or Higher</li> <li>• <b>Hard disk-20 GB or Higher</b></li> </ul>				
<b>Software</b>	<ul style="list-style-type: none"> <li>• TURBO C version 3 (or) GCC version 3.3.4</li> <li>• OS-Windows2000/Windows XP/NT</li> </ul>				

<b>16CS606</b>	<b>NETWORKING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

<b>LIST OF EXPERIMENTS</b>
<ol style="list-style-type: none"> <li>1. Implementation of Socket Programming <ol style="list-style-type: none"> <li>a. TCP Sockets.</li> <li>b. UDP Sockets.</li> <li>c. Applications using Sockets.</li> </ol> </li> <li>2. Implementation of FTP.</li> <li>3. Simulation of Sliding Window Protocol.</li> <li>4. Simulation of Interior Routing Protocols.</li> <li>5. Simulation of Exterior Routing Protocols.</li> <li>6. Development of applications such as DNS/ HTTP/ E – mail/ Multi - user Chat.</li> <li>7. Simulation of Network Management Protocols.</li> <li>8. Study of Network Simulator Packages – such as OPNET, NS2, etc.</li> </ol>

<b>P:60 T:0 TOTAL: 60 PERIODS</b>
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<b>16IT604</b>	<b>INTERNET PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Introduction to the Internet and World Wide Web - History of the Internet - World Wide Web Consortium- History of SGML –XML Introduction to Hypertext Markup Language – Editing HTML - Common Elements –Headers - Linking - Images - Unordered Lists - Nested and Ordered Lists – HTML Tables-Basic HTML Forms CSS: Introduction-Inline-Embedded-Conflicting styles- Linking external style sheets- Positioning elements-Backgrounds-Box Model and Text flow.		

<b>UNIT II</b>	<b>DYNAMIC HTML</b>	<b>9</b>
Dynamic HTML Object Model and Collections, Event Model-Filters and Transitions- Data Binding with Tabular Data Control- Dynamic HTML-Structured Graphics ActiveX Controls- Dynamic HTML-Path, Sequencer and Sprite ActiveX Controls.		

<b>UNIT III</b>	<b>JAVASCRIPT</b>	<b>9</b>
JavaScript, Introduction to Scripting, Control Statements, Functions, Arrays, Objects.		

<b>UNIT IV</b>	<b>XML</b>	<b>9</b>
Creating Markup with XML -Parsers and Well-formed XML Documents -Parsing an XML Document with msxml - Document Type Definition (DTD) - Document Type Declaration -		

Element Type Declarations - Attribute Declarations - Document Object Model – DOM Implementations – DOM Components - path - XSL: Extensible Style sheet Language Transformations (XSLT)

<b>UNIT V</b>	<b>PERL, PHP AND WEB SERVERS</b>	<b>9</b>
Perl - String Processing and Regular Expressions - Form Processing and Business Logic - Server-Side Includes - Verifying a Username and Password - Using DBI to Connect to a Database -PHP - Form Processing and Business Logic -- Dynamic Content in PHP – Multitier Application Architecture - Client-Side Scripting versus Server-Side Scripting- Accessing Web Servers.		

**L:45 T:0 TOTAL : 45 PERIODS**

<b>REFERENCES</b>	
1.	Deitel & Deitel, “Internet & World Wide Web How to Program”, Pearson Education India -Fifth Edition -2012.
2.	Deitel & Deitel, “XML How to Program”, Pearson Education,2001.
3.	Deitel & Deitel Internet & World Wide Web How to Program, Pearson Education India - 3rd Edition -2004.
4.	Robert W.Sebesta, “Programming with World Wide Web”, Pearson Education, 4 <sup>th</sup> Edition, 2009.
5.	Negrino and Smith, “Javascript for the World Wide Web”, 5th Edition, Peachpit Press 2003.

<b>WEB RESOURCES</b>	
1	<a href="http://www.w3schools.com/html/xml">http://www.w3schools.com/html/xml</a>
2	<a href="http://nptel.iitm.ac.in/video.php?subjectId=106105084">http://nptel.iitm.ac.in/video.php?subjectId=106105084</a>

<b>16IT605</b>	<b>ADVANCED DATABASE TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>DISTRIBUTED DATABASES</b>	<b>9</b>
Conventional Databases, Distributed Databases and Relational Databases – Architecture – Fragmentation –Query Processing – Transaction Processing – Concurrency Control – Recovery.		

<b>UNIT II</b>	<b>OBJECT ORIENTED DATABASES</b>	<b>9</b>
Introduction to Object Oriented Data Bases - Approaches - Modeling and Design - Persistence – Query Languages - Transaction - Concurrency – Multi Version Locks – Recovery		

<b>UNIT III</b>	<b>EMERGING SYSTEMS</b>	<b>9</b>
Enhanced Data Models - Client/Server Model - Data Warehousing and Data Mining – Data		

Marts - XML Databases -Web Databases – Mobile Databases-In Memory Database System.

<b>UNIT IV</b>	<b>DATABASE DESIGN ISSUES</b>	<b>9</b>
ER Model - Normalization - Security - Integrity - Consistency - Database Tuning – Optimization and Research Issues – Design of Temporal Databases – Spatial Databases.		

<b>UNIT V</b>	<b>CURRENT ISSUES</b>	<b>9</b>
Rules - Knowledge Bases - Active and Deductive Databases - Parallel databases – Multimedia Databases –Image Databases – Text Database		

**L:45 T:0 TOTAL : 45 PERIODS**

<b>REFERENCES</b>	
1.	Henry F Korth, Abraham Silberschatz, S.Sudharshan, “Database System Concepts”,6 <sup>th</sup> Edition,Mc Graw Hill, 2010.
2.	Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Pearson Education, 6 <sup>th</sup> Edition 2011.
3.	N.Tamer Ozsu, Patrick Valduriez, “Principles Of Distributed Database Systems”,Prentice Hal International Inc., 3rd Edition,2011.
4.	C.S.R Prabhu, “Object-Oriented Database Systems”, Prentice Hall Of India, 3rd Edition,2011.
5.	Raghu Ramakrishna, Johannes Gehrke, “Database Management Systems”, McGraw Hill,3rd Edition 2004.

<b>WEB RESOURCES</b>	
1	<a href="http://cs.uwindsor.ca/~cezeife/courses/60-415/notes/415notes.pdf">http://cs.uwindsor.ca/~cezeife/courses/60-415/notes/415notes.pdf</a>
2	<a href="http://nptel.iitm.ac.in/video.php?subjectId=106106093">http://nptel.iitm.ac.in/video.php?subjectId=106106093</a>

<b>16IT606</b>	<b>DISTRIBUTED OPERATING SYSTEM</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INTRODUCTION AND COMMUNICATION</b>	<b>9</b>
Introduction – Distributed Operating Systems – Network Operating System – Middleware – Client-Server Model – Remote Procedure Call – Remote Object Invocation – Message-Oriented Communication – Threads in Distributed Systems – Code Migration.		

<b>UNIT II</b>	<b>DISTRIBUTED SYNCHRONIZATION &amp; TRANSACTION</b>	<b>9</b>
Clock Synchronization – Logical Clocks – Global States – Election Algorithms – Mutual Exclusion – Distributed Transactions – Consensus and Related Problems – Distributed Deadlocks.		

<b>UNIT III</b>	<b>DISTRIBUTED SHARED MEMORY AND FAULT TOLERANCE</b>	<b>9</b>
Introduction – Data-Centric Consistency Models – Client-Centric Consistency Models – Distribution Protocol – Consistency Protocol – Sequential Consistency and Ivy, Release Consistency and Munin – Introduction to Fault Tolerance – Distributed Commit		

<b>UNIT IV</b>	<b>DISTRIBUTED FILE SYSTEMS</b>	<b>9</b>
Introduction to Distributed File Systems – File Service Architecture – Sun Network File System – The Andrew File System – Recent Advances		

<b>UNIT V</b>	<b>CASE STUDIES</b>	<b>9</b>
CORBA – Mach – JINI- Concurrent programming		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	A.S. Tanenbaum, M. VanSteen, “Distributed Systems”, Pearson Education, 2nd Edition,2008
2.	George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, 5th Edition, Pearson Education, 2011
3.	Mukesh Singhal, “Advanced Concepts in Operating Systems”, McGraw Hill Series in Computer Science, 5th Edition, 2011
4.	P.K.Sinha, “Distributed Operating Systems: Concepts and Design”, Wiley IEEE Press, 1 <sup>st</sup> Edition., 1998
5.	Morgan Kaufman “Distributed and Cloud Computing from Parallel Processing to Interenet,” Kaihwang, JackDongarra and Geoffley C. Fox, 1st Edition,Sep 2011.

<b>WEB RESOURCES</b>
<a href="http://www.cloudbus.org/">http://www.cloudbus.org/</a>
<a href="http://www.csie.nuk.edu.tw/">http://www.csie.nuk.edu.tw/</a>

<b>16IT607</b>	<b>INTERNET PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>LIST OF EXPERIMENTS</b>					
1	Designing web Page using Client Side Scripting and DHTML.				
2	Implement Client Server Scripting Programs.				
3	Implement Simulation of Email and File Transfer Protocols.				
4	Development of Web Services.				
5	Development of XML and Databases based applications.				
6	Implement Server Side Application Using JSP.				
7	Development of Web Customization algorithms.				

8	Development of E-Business Application.
9	Implement Java script programs using control statements, functions and arrays
10	Design a Web page using CSS.
<b>P: 60 T: 0 TOTAL: 45 PERIODS</b>	
<b>HARDWARE / SOFTWARE REQUIRED</b>	
<b>Hardware</b>	<ul style="list-style-type: none"> <li>• PCs</li> <li>• Processor-2.0 GHz or Higher</li> <li>• RAM-256 MB or Higher</li> <li>• Hard disk-20 GB or Higher</li> </ul>
<b>Software</b>	<ul style="list-style-type: none"> <li>• Softwares :Netbeans IDE, XML, Dream Weaver</li> <li>• Programming Languages : Java, Asp.net</li> <li>• Scripting Languages :HTML, VBSCRIPT, JSCRIPT</li> </ul>

<b>16IT608</b>	<b>DISTRIBUTED OPERATING SYSTEM LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>
<b>LIST OF EXPERIMENTS</b>					
1	Implementation of concurrent echo client-server application				
2	Implementation of concurrent day-time client server application				
3	Implementation of counter increment in shared memory.				
4	Implementation of CORBA based client-server application				
5	Implementation of XML Schema and XML instance document.				
6	Implementation of WSDL based arithmetic operations.				
7	Implementation of Election Algorithms				
8	Study on Grid Services using Globus				
9	Development of simple program using hadoop				
<b>P: 60 T: 0 TOTAL= 45 PERIODS</b>					
<b>HARDWARE / SOFTWARE REQUIRED</b>					
<b>Hardware</b>	<ul style="list-style-type: none"> <li>• PCs</li> <li>• Processor-2.0 GHz or Higher</li> <li>• RAM-256 MB or Higher</li> <li>• Hard disk-20 GB or Higher</li> </ul>				
<b>Software</b>	<ul style="list-style-type: none"> <li>• <b>Softwares</b> :Netbeans IDE, XML, Dream Weaver</li> <li>• <b>Programming Languages</b> : Java, Asp.net, Eclipse</li> </ul>				

<b>16IT610</b>	<b>PERVASIVE COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INTRODUCTION TO PERVASIVE COMPUTING</b>	<b>9</b>
Pervasive Computing Application - Pervasive Computing devices and Interfaces - Device technology trends, Connecting issues and protocols.		

<b>UNIT II</b>	<b>WAP AND WML ARCHITECTURE</b>	<b>9</b>
Pervasive Computing and web based Applications - XML and its role in Pervasive Computing - Wireless Application Protocol (WAP) Architecture and Security – Wireless Mark-Up language (WML) – Introduction.		

<b>UNIT III</b>	<b>PERVASIVE DEVICES AND SECURITY</b>	<b>9</b>
Voice Enabling Pervasive Computing - Voice Standards - Speech Applications in Pervasive Computing and security.		

<b>UNIT IV</b>	<b>PDA AND APPLICATIONS</b>	<b>9</b>
PDA in Pervasive Computing – Introduction - PDA software Components, Standards, emerging trends - PDA Device characteristics - PDA Based Access Architecture.		

<b>UNIT V</b>	<b>PERVASIVE INTERFACE DEVICES</b>	<b>9</b>
User Interface Issues in Pervasive Computing, Architecture - Smart Card- based Authentication Mechanisms - Wearable computing Architecture.		

<b>L: 45 T:0 TOTAL : 45 PERIODS</b>	
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<b>REFERENCES</b>	
1.	Jochen Burkhardt, Horst Henn, Stefan Hepper, Thomas Schaec & Klaus Rindtorff. Pervasive Computing Technology and Architecture of Mobile Internet Applications, Addison Wesley, Reading, 2002.
2.	Uwe Hansman, Lothar Merk, Martin S Nicklous & Thomas Stober: Principles of Mobile Computing, Second Edition, Springer- Verlag, New Delhi, 2003.
3.	Rahul Banerjee: Internetworking Technologies: An Engineering Perspective, Prentice – Hall of India, New Delhi, 2003.
4.	Rahul Banerjee: Lecture Notes in Pervasive Computing, Outline Notes, BITS-Pilani, 2012.
5.	Mohammad S. Obaidat, Mieso Denko, Isaac Woungang, “Pervasive Computing and Networking”, Wiley Publications, 2011

<b>16IT611</b>	<b>CLOUD COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>UNDERSTANDING CLOUD COMPUTING</b>	<b>9</b>
Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services		

<b>UNIT II</b>	<b>DEVELOPING CLOUD SERVICES</b>	<b>9</b>
Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-		



Demand Computing – Discovering Cloud Services Development Services and Tools – AmazonEc2 – Google App Engine – IBM Clouds
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<b>UNIT III</b>	<b>CLOUD COMPUTING FOR EVERYONE</b>	<b>9</b>
Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation- SAS Security.		

<b>UNIT IV</b>	<b>USING CLOUD SERVICES</b>	<b>9</b>
Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files.		

<b>UNIT V</b>	<b>OTHER WAYS TO COLLABORATE ONLINE</b>	<b>9</b>
Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis.		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Michael Miller, Cloud Computing: Web-Based Applications, Collaborate Online, QuePublishing, August 2008
2.	John W.Rittinghouse, James F.Ransome, " Cloud Computing Implementation, Management and Security" CRC Press Taylor & Francis group, 2012.
3.	Borko Furht, Armando Escalante, "Hand book of cloud computing (Hard Cover)", Springer New York, 2010.
4.	Haley Beard, "Cloud Computing Best Practices", Emereo Pty Limited, 2nd Edition, August 2009
5.	Robin Murphy , "Introduction to AI Robotics", MIT Press, 1 <sup>st</sup> Edition , 2000.

<b>WEB RESOURCES</b>
1. <a href="http://computer.howstuffworks.com/cloud-computing/cloud-computing1.htm">http://computer.howstuffworks.com/cloud-computing/cloud-computing1.htm</a>
2. <a href="http://www.hcltech.com/services/cloud-computing/cloud-reference-architecture">http://www.hcltech.com/services/cloud-computing/cloud-reference-architecture</a>

<b>16IT612</b>	<b>WIRELESS ADHOC AND SENSOR NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>ADHOC NETWORKS AND ROUTING PROTOCOLS</b>	<b>9</b>
<p>Ad hoc Wireless Networks – Heterogeneity in Mobile Devices –Wireless Sensor Networks – Traffic Profiles – Types of Ad hoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks – Ad hoc wireless Internet. Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols – Table-Driven Routing Protocols: Destination Sequenced Distance Vector (DSDV) – Wireless Routing Protocol (WRP) – Cluster Switch Gateway Routing (CSGR) –On-Demand Routing Protocols: Ad hoc On-Demand Distance Vector Routing (AODV) – Dynamic Source Routing (DSR) – Temporally Ordered Routing Algorithm (TORA) – Signal Stability Routing (SSR) –Location-Aided Routing (LAR) – Power-Aware Routing (PAR) – Zone Routing Protocol (ZRP).</p>		

<b>UNIT II</b>	<b>MULTICAST ROUTING AND SECURITY</b>	<b>9</b>
<p>Issues in Designing a Multicast Routing Protocol – Operation of Multicast Routing Protocols – An Architecture Reference Model for Multicast Routing Protocols –Classifications of Multicast Routing Protocols – Tree-Based Multicast Routing Protocols– Mesh-Based Multicast Routing Protocols – Summary of Tree and Mesh based Protocols – Energy-Efficient Multicasting – Multicasting with Quality of Service Guarantees – Application – Dependent Multicast Routing – Comparisons of Multicast Routing Protocols - Design Goals of a Transport Layer Protocol for Ad hoc Wireless Networks –Classification of Transport Layer Solutions – TCP over Ad hoc Wireless Networks- Security in Ad Hoc Wireless Networks – Network Security Requirements – Issues and Challenges in Security Provisioning – Network Security Attacks – Key Management – Secure Routing in Ad hoc Wireless Networks</p>		

<b>UNIT III</b>	<b>QoS AND ENERGY MANAGEMENT</b>	<b>9</b>
<p>Issues and Challenges in Providing QoS in Ad hoc Wireless Networks – Classifications of QoS Solutions – MAC Layer Solutions – Network Layer Solutions – QoS Frameworks for Ad hoc Wireless Networks- Energy Management in Ad hoc Wireless Networks: Introduction – Need for Energy Management in Ad hoc Wireless Networks – Classification of Energy Management Schemes – Battery Management Schemes – Transmission Power Management Schemes – System Power Management Schemes.</p>		

<b>UNIT IV</b>	<b>SENSOR NETWORKS – ARCHITECTURE AND MAC PROTOCOLS</b>	<b>9</b>
<p>Single node architecture: Hardware components-energy consumption of sensor nodes- Network Architecture - Sensor network scenarios- types of sources and sinks- single hop versus multi-hop networks- multiple sinks and sources- Design principles: Development of wireless sensor networks-physical layer and transceiver design consideration in wireless sensor networks- Energy usage profile-choice of modulation- Power Management- MAC protocols: fundamentals</p>		

of wireless MAC protocols-low duty cycle protocols and wakeup concepts- contention-based protocols- Schedule-based protocols - SMAC- BMAC-Traffic-adaptive medium access protocol (TRAMA)- Link Layer protocols: fundamentals task and requirements- error control- framing-link management.

<b>UNIT V</b>	<b>SENSOR NETWORKS – ROUTING PROTOCOLS AND OPERATING SYSTEMS</b>	<b>9</b>
Gossiping and agent-based unicast forwarding- Energy-efficient Routing: unicast- Broadcast and multicast- geographic routing- mobile nodes- Data-centric routing: SPIN- Directed Diffusion- Energy aware routing- Gradient-based routing: COUGAR- ACQUIRE- Hierarchical Routing: LEACH- PEGASIS. Location Based Routing: GAF- GEAR- Data aggregation – Various aggregation techniques- Introduction to TinyOS – NesC- Interfaces- modules- configuration- Programming in TinyOS using NesC- Emulator TOSSIM		

**L:45 T:0 TOTAL : 45 PERIODS**

<b>REFERENCES</b>	
1.	C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall, PTR, 1 <sup>st</sup> Edition, 2012.
2.	C. K. Toh, “Ad Hoc Mobile Wireless Networks Protocols and Systems”, Prentice Hall, PTR, 1 <sup>st</sup> Edition, 2001.
3.	Charles E. Perkins, “Ad Hoc Networking”, Addison Wesley, 1 <sup>st</sup> Edition, 2000.
4.	Holger Karl and Andreas willig, “Protocol and Architecture for Wireless Sensor Networks”, John wiley publication, 10 <sup>th</sup> Edition, 2006.
5.	Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks: an information processing approach”, Elsevier publication, 2 <sup>nd</sup> Edition, 2004.
6.	Kazem Sohraby, Daniel Minoli and Taieb Znati, “Wireless Sensor Networks Technology- Protocols and Applications”, John Wiley & Sons, 3 <sup>rd</sup> Edition, 2007.

<b>16IT613</b>	<b>4G TECHNOLOGIES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Introduction: History of mobile cellular systems: First Generation- Second Generation- Generation 2.5- Overview of 3G & 4G, 3GPP and 3GPP2 standards- WiMax: Introduction – IEEE 802.16- OFDM- MIMO- IEEE 802.20		

<b>UNIT II</b>	<b>3G NETWORKS</b>	<b>9</b>
3G Networks: Evolution from GSM- 3G Services & Applications- UMTS network structure- Core network- UMTS Radio access- HSPA: HSUPA- HSDPA- CDMA 1X- EVDO Rev -0- Rev- A- Rev-B- Rev-C Architecture- protocol stack		

<b>UNIT III</b>	<b>4G LTE NETWORKS</b>	<b>9</b>
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.		

<b>UNIT IV</b>	<b>IP MULTIMEDIA SUBSYSTEMS AND SIGNALING</b>	<b>9</b>
Signaling in IP Networks: Session Initiation Protocol (SIP)- Session Description Protocol (SDP) 3GPP IP Multimedia Subsystem (IMS)- IMS Architecture- Mobile Station Addressing for Accessing the IMS- Reference Interfaces- Service Architecture- Registration with the IMS- Deregistration with the IMS- End-to-End Signaling Flows for Session Control- 3GPP2 IP Multimedia Subsystem (IMS).		

<b>UNIT V</b>	<b>SPECTRUM, PERFORMANCE AND QOS</b>	<b>9</b>
Spectrum for LTE- Flexibility- Carrier Aggregation- Multi standard Radio base stations- RF requirements for LTE- Power level requirements- Emission requirements-Sensitivity and Dynamic range-Receiver susceptibility. Performance Assessment-Performance Evaluation- Internet QoS- QoS Challenges in Wireless IP Networks- QoS in 3GPP- QoS in 3GPP2		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Juha Korhonen, “Introduction to 3G Mobile Communications”, Artech House, 2 <sup>nd</sup> Edition, 2003.
2.	Erik Dahlman, Stefan Parkvall, Johan Skold, “4G LTE/LTE – Advanced for Mobile Broadband”, Academic Press, 1 <sup>st</sup> Edition, 2011.
3.	Jyh-Cheng Chen and Tao Zhang, “IP-Based Next-Generation Wireless Networks Systems, Architectures, and Protocols”, John Wiley & Sons, Inc. Publication, 1 <sup>st</sup> Edition, 2008.
4.	Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, “3G Evolution HSPA and LTE for Mobile Broadband”, Academic Press, 1 <sup>st</sup> Edition, 2007.
5.	Crosspoint Boulevard, “Wireless and Mobile All-IP Networks”, Wiley Publishing, Inc., 2 <sup>nd</sup> Edition, 2005.

<b>16IT614</b>	<b>CRYPTOGRAPHY AND NETWORK SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>	<b>Introduction to Cryptography and Number Theory</b>				<b>9</b>
Overview of Cryptography – Applications–Classical Cryptosystems–Number Theory–Modular Exponentiation–Fermat’s Theorem and Euler’s Theorem–Euclid Algorithm					
<b>UNIT II</b>	<b>Public Key Ciphers</b>				<b>9</b>
DES-The Strength of DES– Differential and Linear Cryptanalysis – AES – Principles of Public-Key Cryptosystems–RSA Algorithm –Elliptic Curve Cryptography – ElGamal Cryptosystem – Pseudorandom Number Generation					

<b>UNIT III</b>	<b>Cryptographic Data Integrity Algorithms</b>	<b>9</b>
Cryptographic Hash Functions–Secure Hash Algorithm (SHA) –SHA 3–Message Authentication Codes–Security of MACs–MACs Based on Hash Functions: HMAC – MACs Based on Block Ciphers: DAA and CMAC – Authenticated Encryption: CCM and GCM–Hash Functions and MACs. Case study: DNS Security Extensions (DNSSEC)		

<b>UNIT IV</b>	<b>Hash Functions and Digital Signatures</b>	<b>9</b>
Secure Hash Algorithm– Whirlpool – CMAC – Digital Signature – Authentication Protocol – Digital Signature Standard – Kerberos –X.509 Authentication Service – PKI. Case study: Applications of Digital Signature		

<b>UNIT V</b>	<b>Protocols And Firewalls</b>	<b>9</b>
SSL–TLS – SSH - IPsec – Firewall – Packet Filtering, Proxy Services – Bastion Hosts – Electronic Mail Security – PGP, S/MIME. Case Study: Linux Firewall Configuration		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>		
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<b>REFERENCES</b>	
1.	Wade Trappe, Lawrence C. Washington “Introduction to Cryptography with Coding Theory”, Pearson Education International, 2 <sup>nd</sup> Edition, 2006.
2.	William Stallings, “Cryptography & Network Security Principles and Practice”, Pearson Education International, 5 <sup>th</sup> Edition, 2011
3.	AtulKahate, “Cryptography and Network Security”, McGraw Hill Education India, 2 <sup>n</sup> Edition, 2009.
4.	William Stallings, “Network Security Essentials: Applications and standards”, Pearson Education Asia, 3 <sup>rd</sup> Edition 2007.
5.	Behrouz A. Forouzan , “Cryptography and Network Security” , Tata McGraw Hill, India, New Delhi, 4 <sup>th</sup> Edition 2007.

<b>16IT615</b>	<b>SOFTWARE QUALITY AND TESTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>	<b>INTRODUCTION SQA AND TESTING</b>	<b>9</b>			
Quality Assurance Basics : Definition – Quality and Reliability – Evolution of concepts of Quality -Total Quality Management – Organizational and Quality goals – Four Dimensions of Quality : Specification Quality – Design Quality – Development Quality – Conformance Quality-Testing Definition-Software Verification and Validation-Review-Types.					

<b>UNIT II</b>	<b>FLOW GRAPHS AND PATH TESTING</b>	<b>9</b>
Purpose of testing- Dichotomies- Model for testing- Playing Pool and consulting oracle-Is complete testing possible - The taxonomy of bugs: Consequences of bugs- Taxonomy of bugs.Path-testing basics- Predicates, path predicates and achievable paths- Path sensitizing- Path instrumentation- Implementation and application of path testing		

<b>UNIT III</b>	<b>TRANSACTION AND DATA FLOW TESTING</b>	<b>9</b>
Transaction flows- Transaction flow testing techniques- Implementation Comments- Dataflow testing basics – Data flow testing strategies – Application, tools and effectiveness-Software automation tools-Case study.		

<b>UNIT IV</b>	<b>DOMAIN AND LOGIC BASED TESTING</b>	<b>9</b>
Domains and paths- Nice and ugly domains- Domain testing- Domains and interface testing- Domains and testability - Logic based testing: Decision tables- Path expressions again- KV charts		

<b>UNIT V</b>	<b>SPECIAL TESTS</b>	<b>9</b>
Complexity Testing-GUI Testing-Compatibility Testing-Security Testing-Performance Testing, Volume Testing and Stress Testing-Recovery Testing-Error handling testing-Object Oriented Application Testing –COTS Testing-Client-Server Testing-Web Application Testing-Mobile Application Testing-eBusiness / eCommerce Testing-Agile Development Testing- Data Warehousing Testing.		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Boris Beizer, “Software Testing Techniques”, 2 <sup>nd</sup> Edition Reprint, Dreamtech Press, 2009.
2.	Jeff Tian, “Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement”, 1 <sup>st</sup> Edition Reprint, Wiley India Pvt Limited, 2006.
3.	M G Limaye , “Software Testing-Principles, Techniques and Tools”,McGrawHill,2009
4.	William Perry, “Software Testing: Effective Methods for Software Testing”, John Wiley & Sons, 2009.
5.	Glenford J.Myers, “ The Art of Software Testing”, 2 <sup>nd</sup> Edition John Wiley & Sons,2012.

<b>16IT616</b>	<b>MULTIMEDIA DATABASES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>			
Overview of Database Management –Threshold Architecture - Informal look at the Relational Model – SQL – Functional Dependencies - Normalization – Multivalued Dependencies , Join Dependencies – Examples					

<b>UNIT II</b>	<b>MULTIMEDIA DATABASE DESIGN</b>	<b>9</b>
Design and Architecture of a Multimedia Database - Organizing Multimedia Data Based on The Principle of Uniformity - Media Abstractions – Query Languages for Retrieving Multimedia Data.		

<b>UNIT III</b>	<b>ADVANCED DATA STRUCTURES FOR MULTIMEDIA DATABASE</b>	<b>9</b>
Introduction to OODB – K-D trees – Point Quad Trees – MX Quad Tress – R- Trees – Comparison of Different data structures		

<b>UNIT IV</b>	<b>IMAGE AND TEXT DATABASE</b>	<b>9</b>
Similarity Based Retrieval – Representing Image DBs with Relation - Representing Image DBs with R- Trees – Stop Lists – Words Term and Frequency Tables – Latent Semantic Indexing – TV Trees – Case Study: Multimedia feature representation		

<b>UNIT V</b>	<b>VIDEO AND AUDIO DATABASES</b>	<b>9</b>
Organizing Content of a Single Video – Querying Content of Video Libraries – General Model of Audio Data –Indexing Audio Data – Web Based Multimedia Applications – Case Study: Build a Web Database		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Subramanian V. S, “Principles of Multimedia Database Systems”, Elsevier Publishers, 2010.
2.	Elmasri and Navathe,“Fundamentals of Database Systems, 6 <sup>th</sup> Edition, Addison, 2010.
3.	V.S.Subramanian, “Principles of Multimedia Database Systems”, Morgan Kaufmann, Harcourt India Pvt Ltd., 2001.
4.	Khoshafian S. and Bakor A. B., “Multimedia and Imaging Databases”, Elsevier, 1996.
5.	Lynne Dunckley, “Multimedia Databases: An Object-Relational Approach”, Pearson Education, 2003.

<b>16IT617</b>	<b>EMBEDDED SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>EMBEDDED COMPUTING</b>	<b>9</b>
Embedded Computers-Characteristics of Embedded Computing Applications - Challenges of Embedded Systems – Embedded system design process-Embedded processors – ARM processor – The ARM instruction set architecture - ARM and Thumb Instruction sets-Intel ATOM Processors		

<b>UNIT II</b>	<b>EMBEDDED C PROGRAMMING</b>	<b>9</b>
C-looping structures – Register allocation – Function calls – Pointer aliasing – structure arrangement – bit fields – unaligned data and endianness – inline functions and inline assembly – portability issues		

<b>UNIT III</b>	<b>EMBEDDED NETWORK ENVIRONMENT</b>	<b>9</b>
Distributed Embedded Architecture - Hardware and Software Architectures – Networks for embedded systems - I <sup>2</sup> C - CAN Bus - SHARC link ports - Ethernet - Myrinet - Internet - Network Based design-Communication Analysis - system performance Analysis - Hardware platform design - Allocation and scheduling - Design Example : Elevator Controller		

<b>UNIT IV</b>	<b>REALTIME CHARACTERISTICS</b>	<b>9</b>
Clock driven Approach - weighted round robin Approach - Priority driven Approach - Dynamic Versus Static systems - effective release times and deadlines - Optimality of the Earliest deadline first (EDF) algorithm - challenges in validating timing constraints in priority driven systems - Off–line Versus On–line scheduling.		

<b>UNIT V</b>	<b>EMBEDDED SYSTEM DEVELOPMENT</b>	<b>9</b>
Embedded software development tools – Emulators and debuggers-Design Methodologies- Requirement Analysis- Specifications-System analysis and Architecture Design- Quality Assurance. Case study-Intruder Alarm System – Complete design of embedded systems: Telephone PBX- System Architecture - Ink jet printer - Hardware Design and Software Design - Personal Digital Assistants - Set-top Boxes.		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>		
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<b>REFERENCES</b>	
1.	Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, Morgan Kaufmann / Elsevier, 2 <sup>nd</sup> edition, 2005.
2.	Andrew N Sloss, D. Symes, and C. Wright, “ARM System Developers Guide”, Morgan Kaufmann / Elsevier, 2 <sup>nd</sup> Edition, 2012.
3.	Michael J. Pont, “Embedded C”, Pearson Education, 1 <sup>st</sup> Edition, 2008.
4.	W.S. Liu, “Real-Time systems”, Pearson Education Asia, 1 <sup>st</sup> Edition, 2011.
5.	Steve Heath, “Embedded System Design”, Elsevier, 2 <sup>nd</sup> edition, 2004.



<b>16CS720</b>	<b>BIG DATA ANALYTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>UNIT-I</b>	<b>INTRODUCTION TO BIG DATA</b>	<b>9</b>
<p>Analytics – Nuances of big data – Value – Issues – Case for Big data – Big data options Team challenge – Big data sources – Acquisition – Nuts and Bolts of Big data. Features of Big Data - Security, Compliance, auditing and protection - Evolution of Big data – Best Practices for Big data Analytics - Big data characteristics - Volume, Veracity, Velocity, Variety – Data Appliance and Integration tools – Greenplum – Informatica.</p>		
<b>UNIT-II</b>	<b>DATA ANALYSIS</b>	<b>9</b>
<p>Evolution of analytic scalability – Convergence – parallel processing systems – Cloud computing – grid computing – map reduce – enterprise analytic sand box – analytic data sets – Analytic methods – analytic tools – Cognos – Microstrategy - Pentaho. Analysis approaches – Statistical significance – business approaches – Analytic innovation – Traditional approaches – Iterative</p>		
<b>UNIT-III</b>	<b>STREAM COMPUTING</b>	<b>9</b>
<p>Introduction to Streams 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 - Realtime Analytics Platform(RTAP) applications IBM Infosphere – Big data at rest – Infosphere streams – Data stage – Statistical analysis – Intelligent scheduler – Infosphere Streams.</p>		
<b>UNIT-IV</b>	<b>PREDICTIVE ANALYTICS AND VISUALIZATION</b>	<b>9</b>
<p>Predictive Analytics – Supervised – Unsupervised learning – Neural networks – Kohonen models – Normal – Deviations from normal patterns – Normal behaviours – Expert options – Variable entry - Mining Frequent itemsets - Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications:</p>		
<b>UNIT-V</b>	<b>FRAMEWORKS AND APPLICATIONS</b>	<b>9</b>
<p>IBM for Big Data – Map Reduce Framework - Hadoop – Hive - – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Hbase – Impala – Analyzing big data with twitter – Big data for ECommerce – Big data for blogs.</p>		

<b>L:45</b>	<b>T:0</b>	<b>T: 45 PERIODS</b>
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## REFERENCES

1. Frank J Ohlhorst, “Big Data Analytics: Turning Big Data into Big Money”, Wiley and SAS Business Series, 2012.
2. Colleen Mccue, “Data Mining and Predictive Analysis: Intelligence Gathering and Crime Analysis”, Elsevier, 2007.
3. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
4. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.
5. Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, Wiley and SAS Business Series, 2012.
6. Paul Zikopoulos, Chris Eaton, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGraw Hill, 2011.
7. Paul Zikopoulos, Dirk deRoos, Krishnan Parasuraman, Thomas Deutsch , James Giles, David
8. Corrigan, “Harness the Power of Big data – The big data platform”, McGraw Hill, 2012.
9. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007
10. Pete Warden, Big Data Glossary, O’Reilly, 2011.
11. Jiawei Han, Micheline Kamber “Data Mining Concepts and Techniques”, Second Edition, Elsevier, Reprinted 2008.

<b>16IT619</b>	<b>ARTIFICIAL INTELLIGENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Intelligent Agents – Agents and environments – Good behavior – The nature of environments – structure of agents – Problem Solving – problem solving agents –example problems – searching for solutions – uniformed search strategies – avoiding repeated states – searching with partial information.		

<b>UNIT II</b>	<b>SEARCHING TECHNIQUES</b>	<b>9</b>
Informed search strategies – heuristic function – local search algorithms and optimistic problems – local search in continuous spaces – online search agents and unknown environments – Constraint satisfaction problems (CSP) – Backtracking search and Local search – Structure of problems – Adversarial Search – Games – Optimal decisions in games – Alpha – Beta Pruning – imperfect real-time decision – games that include an element of chance.		

<b>UNIT III</b>	<b>KNOWLEDGE REPRESENTATION</b>	<b>9</b>
First order logic - syntax and semantics – Using first order logic – Knowledge engineering –		

Inference – propositional versus first order logic – unification and lifting –forward chaining – backward chaining – Resolution – Knowledge representation –Ontological Engineering – Categories and objects – Actions – Simulation and events.

<b>UNIT IV</b>	<b>LEARNING</b>	<b>9</b>
Learning from observations – forms of learning – Inductive learning - Learning decision trees – Ensemble learning – Knowledge in learning – Logical formulation of learning –Explanation based learning – Learning using relevant information – Inductive logic programming - Statistical learning methods – Learning with complete data – Learning with hidden variable – EM algorithm – Instance based learning – Neural networks.		

<b>UNIT V</b>	<b>ROBOTICS</b>	<b>9</b>
Introduction – Robot hardware–Robotic perception–Planning to move –Planning uncertain movements –Moving–Robotic software Architectures		

**L:45 T:0 TOTAL : 45 PERIODS**

<b>REFERENCES</b>	
1.	Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education / Prentice Hall of India, 2 <sup>nd</sup> Edition 2011
2.	Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, Harcourt Asia Pvt. Ltd, 1 <sup>st</sup> Edition 2010.
3.	Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill, 2 <sup>nd</sup> Edition 2007.
4.	George F. Luger, “Artificial Intelligence-Structures and Strategies for Complex Problem Solving”, Pearson Education / PHI, 5 <sup>th</sup> Edition 2009
5.	Robin Murphy , “Introduction to AI Robotics” , MIT Press, 1 <sup>st</sup> Edition , 2000.

<b>16IT620</b>	<b>INFORMATION SYSTEM DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INFORMATION SYSTEM AND ORGANIZATION</b>	<b>9</b>
Information Systems in Global Business Today-role of information systems – Contemporary approaches to Information System-The challenge of Information System-Organization and Information Systems-Impact of Information Systems in Organization and Business– Impact of IT on Management Decision making-Information System and Business strategy.		

<b>UNIT II</b>	<b>REPRESENTATION AND ANALYSIS OF SYSTEM STRUCTURE</b>	<b>9</b>
Models for Representing Systems: Mathematical, Graphical and Hierarchical (Organization Chart, Tree Diagram) – Information Flow – Process Flow – Methods and Heuristics – Decomposition and Aggregation – Information Architecture - Application of System Representation to Case Studies		

<b>UNIT III</b>	<b>SYSTEMS, INFORMATION AND DECISION THEORY</b>	<b>9</b>
Information Theory – Information Content and Redundancy – Classification and Compression – Summarizing and Filtering – Inferences and Uncertainty – Identifying Information needed to		

Support Decision Making – Human Factors – Problem characteristics and Information System Capabilities in Decision Making

<b>UNIT IV</b>	<b>INFORMATION SYSTEM APPLICATION</b>	<b>9</b>
Information System Acquisition-Transaction Processing Applications – Basic Accounting Application – Applications for Budgeting and Planning – Other use of Information Technology: Automation – Word Processing – Electronic Mail – Evaluation Remote Conferencing and Graphics – System and Selection – Cost Benefit – Centralized versus Decentralized Allocation Mechanism		

<b>UNIT V</b>	<b>DEVELOPMENT AND MAINTENANCE OF INFORMATION SYSTEMS</b>	<b>9</b>
Systems analysis and design – System development life cycle – Limitation – End User Development – Managing End Users – off-the Shelf Software Packages – Outsourcing – Comparison of Different Methodologies		

**L: 45 T:0 TOTAL : 45 PERIODS**

<b>REFERENCES</b>	
1.	K. C. Laudon, J. P. Laudon, M. E. Brabston, “Management Information Systems: Managing the Digital Firm”, Pearson Education, 13 <sup>th</sup> edition, 2014.
2.	K. C. Laudon, J. P. Laudon, “Management Information Systems, Organization and Technology in the Networked Enterprise”, Prentice Hall, 11 <sup>th</sup> Edition, 2010.
3.	Jeffrey A. Hoffer, Joey F. George, Joseph S. Valachich, “Modern Systems Analysis and Design”, Prentice Hall, 7 <sup>th</sup> Edition, 2013.
4.	Ralph Stair, “Principles of Information Systems”, Cengage Learning, 11 <sup>th</sup> Edition, 2012.
5.	Stephen Haag and Maeve Cummings, “Information Systems Essentials”, Mc-graw Hill /Irwin, 9 <sup>th</sup> Edition, 2011.

<b>16IT621</b>	<b>COMPONENT BASED TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
. Software Components – objects – fundamental properties of Component technology –modules –interfaces – callbacks – directory services – component architecture –components and middleware.		

<b>UNIT II</b>	<b>JAVA COMPONENT TECHNOLOGIES</b>	<b>9</b>
Threads – Java Beans – Events and connections – properties – introspection – JAR files– reflection – object serialization – Enterprise Java Beans – Distributed Object models –RMI and RMI-IIOP – Case Study: Distributed Coordination-Based System – JINI.		

<b>UNIT III</b>	<b>CORBA TECHNOLOGIES</b>	<b>9</b>
Java and CORBA – Interface Definition language – Object Request Broker – system object		

model – portable object adapter – CORBA services – CORBA component model – containers – application server – model driven architecture

<b>UNIT IV</b>	<b>COM AND .NET TECHNOLOGIES</b>	<b>9</b>
COM – Distributed COM – object reuse – interfaces and versioning – dispatch interfaces – connectable objects – OLE containers and servers – Active X controls – .NET components – assemblies – appdomains – contexts – reflection – remoting.		

<b>UNIT V</b>	<b>COMPONENT FRAMEWORKS AND DEVELOPMENT</b>	<b>9</b>
Connectors – contexts – EJB containers – CLR contexts and channels – Black Box component framework – directory objects – cross-development environment – component-oriented programming – Component design and implementation tools – testing tools - assembly tools.		

**L: 45 T:0 TOTAL : 45 PERIODS**

<b>REFERENCES</b>	
1.	Clemens Szyperski, “Component Software: Beyond Object-Oriented Programming”, Pearson Education publishers, 2003.
2.	Ed Roman, “Enterprise Java Beans3.1”, Sixth Edition , Wiley , 2010.
3.	Mowbray, “Inside CORBA”, Pearson Education, New Delhi, 2003.
4.	Freeze, “Visual Basic Development Guide for COM & COM+”, BPB Publication, New Delhi, 2001.
5.	Hortsamann, Cornell, “CORE JAVA Vol-II” Sun Press, New Delhi, 2002

<b>16IT703</b>	<b>VIRTUALIZATION TECHNIQUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>UNIT I</b>	<b>OVERVIEW OF VIRTUALIZATION</b>	<b>9</b>
Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-level or Operating Virtualization – Application Virtualization-Virtualization Advantages – Virtual Machine Basics – Taxonomy of Virtual machines - Process Virtual Machines – System Virtual Machines – Hypervisor - Key Concepts.		

<b>UNIT II</b>	<b>SERVER CONSOLIDATION</b>	<b>9</b>
Hardware Virtualization – Virtual Hardware Overview - Sever Virtualization – Physical and Logical Partitioning - Types of Server Virtualization – Business cases for Sever Virtualization – Uses of Virtual server Consolidation – Planning for Development – Selecting server Virtualization Platform.		

<b>UNIT III</b>	<b>NETWORK VIRTUALIZATION</b>	<b>9</b>
Architecture - WAN Virtualization - Virtual Enterprise Transport Virtualization–VLANs and Scalability - Theory Network Device Virtualization Layer 2 - VLANs Layer 3 VRF Instances Layer 2 - VFIs Virtual Firewall Contexts Network Device Virtualization - Data- Path Virtualization Layer 2: 802.1q - Trunking Generic Routing Encapsulation – IPSec L2TPv3 Label		

Switched Paths - Control-Plane Virtualization–Routing Protocols- VRF - Aware Routing Multi-Topology Routing.

<b>UNIT IV</b>	<b>VIRTUALIZING STORAGE</b>	<b>9</b>
SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables – Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model – Host based Architecture – Storage based architecture – Network based Architecture – Fault tolerance to SAN – Performing Backups – Virtual tape libraries.		

<b>UNIT V</b>	<b>PRACTICAL VIRTUALIZATION</b>	<b>9</b>
Practical Virtualization Solutions: Comparison of Virtualization Technologies: Guest OS/ Host OS –Hypervisor – Emulation – Kernel Level – Shared Kernel, Enterprise Solutions: VMWare Server –VMWare ESXi – Citrix Xen Server – Microsoft Virtual PC - Virtual Box- Server Virtualization: Configuring Servers with Virtualization – Adjusting and Tuning Virtual servers – VM Backup – VM Migration, Desktop Virtualization: Terminal services – Hosted Desktop – Web-based Solutions – Localized Virtual Desktops, Network and Storage Virtualization: Virtual Private Networks – Virtual LAN – SAN and VSAN – NAS		

**L: 45 T:0 TOTAL : 45 PERIODS**

<b>REFERENCES</b>	
1.	William von Hagen, “Professional Xen Virtualization”, Wrox Publications, January, 2008.
2.	Chris Wolf, Erick M. Halter, “Virtualization: From the Desktop to the Enterprise”, A Press, 2005.
3.	Kumar Reddy, Victor Moreno, “Network virtualization”, Cisco Press, July, 2006.
4.	David Marshall, Wade A. Reynolds, “Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center”, Auerbach Publications, 2006.
5.	Kenneth Hess , Amy Newman, “Practical Virtualization Solutions: Virtualization from the Trenches”, Prentice Hall, 2010

<b>16IT704</b>	<b>OBJECT ORIENTED SOFTWARE DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Software Engineering Concepts – software development life cycle - Development Activities – Managing Software Development – Unified Modeling Language – Architectural Modeling.		

<b>UNIT II</b>	<b>ANALYSIS</b>	<b>9</b>
Requirements Elicitation – Concepts – Activities – Management – Techniques – Documentation– Analysis Object Model – Analysis Static Models – Analysis Dynamic Models.		

<b>UNIT III</b>	<b>SYSTEM DESIGN</b>	<b>9</b>
System Design Concepts – Overview of System Design – Decomposing the system – System Design Activities – Data flow oriented design - Architectural Styles – Design Patterns – Addressing Design Goals – Managing System Design.		

<b>UNIT IV</b>	<b>OBJECT DESIGN AND IMPLEMENTATION ISSUES</b>	<b>9</b>
Implementation Workflow – Reusing Pattern Solutions – Specifying Interfaces – Mapping Models to Code – Mapping Object Model to Database Schema - Testing.		

<b>UNIT V</b>	<b>MANAGING CHANGE</b>	<b>9</b>
Rationale Management – Configuration Management – Project Management – Quality Management – Metrics - Maintenance		

<b>L: 45 T:0</b>	<b>TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Bernd Bruegge, Alan H Dutoit, Object-Oriented Software Engineering, 2nd, Pearson Education, 2004.
2.	Stephen Schach, Software Engineering 7th edition, McGraw-Hill, 2007
3.	Grandy Booch, James Rumbough, Ivar Jacobson. The Unified Modeling Language UserGuide, Pearson Education 2002.
4.	Roger Pressman, “Software Engineering”, Sixth edition, Tata McGraw Hill.
5.	Timothy C. Lethbridge, Robert Laganriere “Object-Oriented Software Engineering – A practical software development using UML and Java”, Tata McGraw-Hill, New Delhi.

<b>16IT705</b>	<b>ENTERPRISE RESOURCE PLANNING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INTRODUCTION TO ERP</b>	<b>9</b>
Overview – Benefits of ERP – ERP and Related Technologies – Business Intelligence-Business Process Reengineering – Data Warehousing – Data Mining – On-line Analytical Processing – Supply Chain Management.		

<b>UNIT II</b>	<b>ERP IMPLEMENTATION</b>	<b>9</b>
Implementation Life Cycle – Implementation Methodology – Hidden Costs – Organizing Implementation – Vendors, Consultants and Users – Contracts – Project Management and Monitoring- Pre & Post Implementation Activities.		

<b>UNIT III</b>	<b>BUSINESS MODULES</b>	<b>9</b>
Business Modules in an ERP Package – Finance – Manufacturing – Human Resource – Plant Maintenance – Materials Management – Quality Management – Marketing- Sales, Distribution and Service.		

<b>UNIT IV</b>	<b>ERP MARKET</b>	<b>9</b>
ERP Market Place – SAP AG – PeopleSoft – Baan Company – JD Edwards World Solutions Company – Oracle Corporation – QAD Inc– System Software Associates-Lawson Software.		

<b>UNIT V</b>	<b>ERP – PRESENT AND FUTURE</b>	<b>9</b>
Turbo Charge the ERP System – EIA – ERP and E-Commerce – ERP, Internet and WWW – ERP and Total Quality Management - Future Directions and Trends in ERP.		

<b>L: 45 T:0</b>	<b>TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>					
1.	Alexis Leon, “ERP Demystified”, Tata McGraw Hill, 2 <sup>nd</sup> Edition, 2008.				
2.	. Ellen F. Monk, Bret J. Wangner, “Concepts in Enterprise Resource Planning”, Thomson Learning, 4 <sup>th</sup> Edition, 2012.				
3.	Vinod Kumar Garg, N.K .Venkata Krishnan, “Enterprise Resource Planning – Concepts and Practice”, Prentice Hall, 2 <sup>nd</sup> Edition, 2011.				
4.	D.P.Goyal, “Enterprise Resource Planning, A Managerial Perspective”, Tata McGraw Hill, 1 <sup>st</sup> Edition, 2011.				
5.	Rajesh Ray, “Enterprise Resource Planning – Text & Cases”, Tata McGraw Hill, 1 <sup>st</sup> Edition, 2011				
<b>16IT706</b>	<b>MOBILE COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>THE WIRELESS CHANNEL</b>	<b>9</b>
Overview of wireless systems – Physical modeling for wireless channels – Time and Frequency coherence – Statistical channel models – Capacity of wireless Channel-Capacity of Flat Fading Channel — Channel Distribution Information known – Channel Side Information at Receiver – Channel Side Information at Transmitter and Receiver –Capacity with Receiver diversity – Capacity comparisons – Capacity of Frequency Selective Fading channels		

<b>UNIT II</b>	<b>PERFORMANCE OF DIGITAL MODULATION OVER WIRELESS CHANNELS</b>	<b>9</b>
Fading– Outage Probability– Average Probability of Error – Combined Outage and Average Error Probability – Doppler Spread – Intersymbol Interference.		

<b>UNIT III</b>	<b>DIVERSITY</b>	<b>9</b>
Realization of Independent Fading Paths – Receiver Diversity – Selection Combining – Threshold Combining – Maximal-Ratio Combining – Equal - Gain Combining – Transmitter Diversity – Channel known at Transmitter – Channel unknown at Transmitter – The Alamouti Scheme.		

<b>UNIT IV</b>	<b>MOBILE SYSTEM AND NETWORK ARCHITECTURES</b>	<b>9</b>
GSM services and features – GSM system architecture – GSM radio subsystem – Frame structure for GSM – Signal processing in GSM – GPRS network architecture – GPRS services and features – 3G UMTS network architecture – UMTS services and features. – Case study IEEE 802.11a		

<b>UNIT V</b>	<b>CELLULAR CONCEPTS</b>	<b>9</b>
Frequency Reuse – Channel Assignment Strategies – Hand off Strategies – Interference and system capacity- Co-Channel Interference- Adjacent Channel Interference – Trunking and Grade of service – Improving coverage & capacity in cellular systems-Cell Splitting- Sectoring- Repeaters for Range Extension-Microcell Zone Concept.		

<b>L: 45 T:0</b>	<b>TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005
2.	David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Cambridge University Press, 2005.



3.	W.C.Y.Lee, "Mobile Cellular Telecommunications - Analog and Digital Systems", 2 <sup>nd</sup> Edition. Tata McGraw Hill 2006.
4.	A.Paulraj, R.Nabar, D.Gore, "Introduction to Space-Time Wireless Communication", Cambridge University Press, 2003
5.	Theodore.S. Rappaport, "Wireless Communications: Principles and Practice", Pearson Education, 2 <sup>nd</sup> Edition, India, 2009

<b>16CS617</b>	<b>AGENT BASED INTELLIGENT SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Definitions - Foundations - History - Intelligent Agents-Problem Solving-Searching -Heuristics - Constraint Satisfaction Problems - Game playing.		

<b>UNIT II</b>	<b>KNOWLEDGE REPRESENTATION AND REASONING</b>	<b>9</b>
Logical Agents-First order logic-First Order Inference-Unification-Chaining- Resolution Strategies-Knowledge Representation-Objects-Actions-Events-Logical Recovery		

<b>UNIT III</b>	<b>PLANNING AGENTS</b>	<b>9</b>
Planning Problem-State Space Search-Partial Order Planning-Graphs-Nondeterministic - Domains-Conditional Planning-Continuous Planning-Multi Agent Planning.		

<b>UNIT IV</b>	<b>AGENTS AND UNCERTAINTY</b>	<b>9</b>
Acting under uncertainty – Probability Notation-Bayes Rule and use – Bayesian- Networks- Other Approaches-Time and Uncertainty-Temporal Models- Utility Theory -Decision Network – Complex Decisions.		

<b>UNIT V</b>	<b>HIGHER LEVEL AGENTS</b>	<b>9</b>
Knowledge in Learning-Relevance Information-Statistical Learning Methods-Reinforcement Learning-Communication-Formal Grammar-Augmented Grammars-Future of AI.		

<b>L: 45 T:0</b>	<b>TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Stuart Russell and Peter Norvig, "Artificial Intelligence - A Modern Approach", 2 <sup>nd</sup> Edition,Prentice Hall, 2002.
2.	Nils.J.Nilsson, Principles of Artificial Intelligence, Narosa Publishing House.
3.	J.Ferber, Multi-agent Systems-An Introduction to Distributed Artificial Intelligence, Addison Wesley, 1999.
4.	Michael Wooldridge, "An Introduction to Multi Agent System", John Wiley, 2002.
5.	Patrick Henry Winston, Artificial Intelligence, III Edition, AW, 1999.

<b>16CS614</b>	<b>BIOINFORMATICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>	<b>INTRODUCTORY OF DATABASE AND NETWORK CONCEPTS</b>				<b>9</b>
The Central Dogma – The Killer Application – Parallel Universes – Watson’s Definition – Top Down Versus Bottom up – Information Flow – Convergence – – Data Management – Data Lifecycle – Database Technology – Interfaces – Implementation – Networks – Geographical Scope– Communication Models – Transmissions Technology – Protocols – Bandwidth – Topology –Hardware – Contents – Security – Ownership – Implementation – Management.					

<b>UNIT II</b>	<b>SEARCH ENGINES AND DATA VISUALIZATION</b>				<b>9</b>
The search process – Search Engine Technology – Searching and Information Theory – Computational methods – Search Engines and Knowledge Management – Data Visualization – Sequence visualization – structure visualization – user Interface – Animation Versus simulation– General Purpose Technologies.					

<b>UNIT III</b>	<b>STATISTICS AND DATA MINING</b>				<b>9</b>
Statistical concepts – Microarrays – Imperfect Data – Basics - Randomness – Variability – Approximation – Interface Noise – Assumptions – Sampling and Distributions – Hypothesis Testing – Quantifying Randomness – Data Analysis – Tool selection statistics of Alignment – Clustering and Classification – Data Mining – Methods – Selection and Sampling – Preprocessing and Cleaning – Transformation and Reduction – Data Mining Methods – Evaluation – Visualization – Designing new queries – Infrastructure Pattern Recognition and Discovery – Machine Learning – Text Mining – Tools– Dot Matrix Analysis – Substitution Matrix – Dynamic Programming – Word Method – Bayesian Method – Multiple Sequence Alignment Tools.					

<b>UNIT IV</b>	<b>PATTERN MATCHING</b>				<b>9</b>
Pattern Matching Fundamentals - Pair wise sequence alignment – Local versus global alignment– Multiple sequence alignment – Computational methods – Dot Matrix analysis – Substitution matrices – Dynamic Programming – Word methods – Bayesian methods – Multiple sequence alignment – Dynamic Programming - Progressive strategies – Iterative strategies – Tools –Nucleotide Pattern Matching – Polypeptide pattern matching – Utilities – Sequence Databases.					

<b>UNIT V</b>	<b>MODELING AND SIMULATION</b>				<b>9</b>
Pattern Matching Fundamentals - Pair wise sequence alignment – Local versus global alignment– Multiple sequence alignment – Computational methods – Dot Matrix analysis – Substitution matrices – Dynamic Programming – Word methods – Bayesian methods – Multiple sequence alignment – Dynamic Programming - Progressive strategies – Iterative strategies – Tools – Nucleotide Pattern Matching – Polypeptide pattern matching – Utilities – Sequence Databases.					

<b>L: 45 T:0</b>	<b>TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Bryan Bergeron, “Bio Informatics Computing”, Second Edition, Pearson Education, 2003.

2.	Westhead.D.R, Parish.J.H,Twyman.R.M, Instant Notes in Bio Informatics, BIOS Scientific Publishers 2000.
3.	C.Gibas & P.Jambeck, Developing Bioinformatics Skills, O'Reilly,1999.
4.	T.K.Attwood and D.J. Perry Smith, "Introduction to Bio Informatics, Longman Essen, 1999.
5.	Pierre Baldi, SorenBrunak, "Bio Informatics – The Machine Learning Approach", 2ndEdition, First East West Press, 2003
6.	Zoe Lacroix and Terence Critchlow, "Bioinformatics: Managing Scientific Data", The Morgan Kaufmann Series in Multimedia Information and Systems, 1st Edition 2003.

<b>16SW605</b>	<b>SOFTWARE PROJECT MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Introduction to Software Project Management, An Overview of Project Planning: Select Project, Identifying Project scope and Objectives, infrastructure, project products a characteristics. Estimate efforts, Identify activity risks, and Allocate resources.		

<b>UNIT II</b>	<b>PROJECT EVALUATION</b>	<b>9</b>
Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, structured methods.		

<b>UNIT III</b>	<b>ESTIMATION</b>	<b>9</b>
Software Effort Estimation: Problems with over and under estimations, Basis of software estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling activities, networks planning models, formulating a network model.		

<b>UNIT IV</b>	<b>RISK MANAGEMENT</b>	<b>9</b>
Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.		

<b>UNIT V</b>	<b>ORGANIZATIONAL BEHAVIOR</b>	<b>9</b>
Introduction – Understanding Behavior – Organizational Behavior: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team –Decision Making – Leadership – Organizational Structures – Stress –Health And Safety.		

<b>L: 45 T:0</b>	<b>TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Bob Hughes and Mike Cotterell,"Software Project Management", Fourth Edition, 2006.
2.	Pressman, Roger,"Software Engineering", A Practitioner's approach.McGrawHill, 2009.
3.	Ramesh, Gopaldaswamy, "Managing Global Projects", Tata McGraw Hill, 2005.
4.	Humphrey, Watts,"Managing the Software Process ", Addison Wesley, 2006.
5.	Wheelwright and Clark,"Revolutionising product development", The Free Press, 2000.

<b>16CS620</b>	<b>CYBER FORENSICS AND INFORMATION SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>	<b>INTRODUCTION</b>				<b>9</b>
Cyber Forensics- Cyber Forensic Investigation Process- Driving Force behind Implementing Corporate Cyber-Rounding out of the Field- Auditing vs Cyber Forensic Investigation- Cyber Forensics Tools and utilities- Concealment Techniques: Spoliation- Cryptography- Steganography- Cloaking Techniques- Data hiding on NTFS					

<b>UNIT II</b>	<b>STANDARD OPERATION PROCEDURES</b>	<b>9</b>
Digital Forensic Laboratory Accreditation Standards- Laboratory Manager checklist- Digital Forensic Examiner Checklist- Technician or Assistant Checklist- Budget Checklist- Training and Testing Checklist- Evidence Control Checklist- Quality Assurance Checklist- Equipment checklist- Cyber Forensics Investigation and Internal Auditing- Internal Control Questionnaire- Cyber Crime.		

<b>UNIT III</b>	<b>INFORMATION SECURITY</b>	<b>9</b>
History, what is Information Security, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC.		

<b>UNIT IV</b>	<b>SECURITY INVESTIGATION &amp; SECURITY ANALYSIS</b>	<b>9</b>
Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional issues. Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk.		

<b>UNIT V</b>	<b>PHYSICAL DESIGN &amp; LOGICAL DESIGN</b>	<b>9</b>
Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel. Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model.		

<b>L: 45 T:0</b>	<b>TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Cyber Forensics-A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes by Albert J Marcella, Robert s. Greenfield -Auerbach Publications, 2nd Edition,2007.
2.	Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Cengage Learning, 4th edition, 2011.

3.	Albert Marcella Jr., Doug Menendez “Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving” Auerbach Publications, 2nd edition, 2008.
4.	Albert J Marcella Jr., Frederic Guillosoou “Cyber Forensics: From Data to Digital Evidence”, Wiley Corporate F & A, 2012.
5.	Micki Krause, Harold F. Tipton, “Handbook of Information Security Management”, Vol 1-3 CRC Press LLC, 2004.
6.	Stuart McClure, Joel Scrambray, George Kurtz, “Hacking Exposed”, Tata McGraw-Hill, 2003.
7.	Matt Bishop, “Computer Security Art and Science”, Pearson/PHI, 2002.

<b>16CS712</b>	<b>DISTRIBUTED COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT-I</b>	<b>COMMUNICATION IN DISTRIBUTED SYSTEMS</b>	<b>9</b>
Introduction – Goals – Various Paradigms in Distributed Applications – Remote Procedure Call – Remote Object Invocation – Message-Oriented Communication – Stream Oriented Communication – Group Communication.		

<b>UNIT-II</b>	<b>DISTRIBUTED OPERATING SYSTEMS</b>	<b>9</b>
Message-Oriented middleware, Issues in Distributed Operating System – System Models- Processor Allocation – Threads in Distributed Systems – Clock Synchronization – Election Algorithms – Distributed Mutual Exclusion – Distributed Transactions – Distributed Deadlock – Agreement Protocols.		

<b>UNIT-III</b>	<b>DISTRIBUTED RESOURCE MANAGEMENT</b>	<b>9</b>
Introduction to traditional web services: XML – SOAP and the WS standards – Distributed Shared Memory – Data Centric Consistency Models – Client Centric Consistency Models – Distribution Protocols – Distributed File Systems – Sun NFS-CODA File System.		

<b>UNIT-IV</b>	<b>FAULT TOLERANCE</b>	<b>9</b>
Introduction to Fault Tolerance – Distributed Commit Protocols – Byzantine Fault Tolerance – Distributed Commit – Recovery – Synchronous Network Algorithms.		

<b>UNIT-V</b>	<b>CASE STUDY IN DISTRIBUTED SYSTEMS</b>	<b>9</b>
Introduction to CHORUS – CORBA – Distributed COM – GLOBE – JINI– Comparison of AMOEBA – MACH and CHORUS – Distributed Snapshot Global State Collection – Case study of Ethernet anomalies in a Distributed Computing Environment.		

<b>L: 45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Andrew.S.Tanenbaum, Maarten Van Steen, “Distributed Systems Principles and Paradigms”, Second Edition, Pearson Education, 2007.
2.	George Coulouris, Jean Dollimore, Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Addition Wesley, 2011.
3.	Hagit Attiya and Jennifer Welch, “Distributed Computing: Fundamentals, Simulations and Advanced Topics”, Second Edition, Wiley Publications, 2004.

4.	Mukesh Singhal, “Advanced Concepts in Operating Systems”, First Edition , McGraw Hill Series in Computer Science, 1994.
5.	M.L.Liu, “Distributed Computing Principles and Applications”, Second Edition, Addison Wesley, 2004.
6.	Pradeep.K.Sinha, “Distributed Operating System Concepts and Design”, Sixth Edition, PHI, 1997.
7.	Nancy A.Lynch, “Distributed Algorithms”, First Edition, Morgan Kaufmann Publishers, 2007.

<b>16CS619</b>	<b>DATA WAREHOUSING AND DATA MINING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT-I</b>	<b>WAREHOUSING AND EXTRATION</b>	<b>9</b>
Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata, Query reporting tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.		

<b>UNIT-II</b>	<b>MINING AND TRANSFORMATION</b>	<b>9</b>
Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.		

<b>UNIT-III</b>	<b>CLASSIFICATION AND PREDICTION</b>	<b>9</b>
Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.		

<b>UNIT-IV</b>	<b>CLUSTERING</b>	<b>9</b>
Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data – Clustering with constraints – Outlier Analysis and detection methods.		

<b>UNIT-V</b>	<b>MULTIMEDIA MINING</b>	<b>9</b>
Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining -Applications and trends in data mining- Data Mining tools: WEKA and Rapid Miner , Big Data.		

<b>L:45 T:0 T: 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2.	Jiawei Han and Micheline Kamber “Data Mining Concepts and Techniques” Elsevier, Third Edition, print 2011.
3.	Ian H. Witten, Eibe Frank, Mark A. Hall “Data Mining: Practical Machine Learning Tools and Techniques” Elsevier 2011.
4.	Pete Warden, “Big Data Glossary”, O’Reilly , 2011.
5.	M.Golfarelli, S.Rizzi,” Data warehouse Design: Modern Principles and Methodologies”, McGraw-Hill, 2009.
6.	Margaret H.Dunham,”Data Mining: Introductory and Advanced Topics”, Prentice Hall, 2003.
7.	Pang-Ning Tna, Michael Stunbach and Vipin Kumar,” Introduction to Data mining” Pearson Addison Wesley, 2005.
8.	Viktor Mayer-Schonberger, Kenneth Cukier, “Big Data: A Revolution That Will Transform How We Live, Work, and Think”, 2013.

<b>16CS707</b>	<b>SOFT COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT-I</b>	<b>INTRODUCTION</b>	<b>9</b>
Evolution of Computing – Introduction – Soft Computing Constituents – From Conventional AI to Computational Intelligence – Neuro-fuzzy and soft computing characteristics – Fuzzy Set Theory – Fuzzy sets – Fuzzy rules and Fuzzy Reasoning.		

<b>UNIT-II</b>	<b>FUZZY LOGIC</b>	<b>9</b>
Crisp set and Fuzzy set – Basic concepts of Fuzzy Sets – Operations on Fuzzy Sets – Fuzzy Relations – Membership Functions – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.		

<b>UNIT-III</b>	<b>GENETIC ALGORITHMS</b>	<b>9</b>
Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning – Machine Learning Approach to Knowledge Acquisition.		

<b>UNIT-IV</b>	<b>NEURAL NETWORKS</b>	<b>9</b>
Basic Concepts of neural networks – Neural network architectures – Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks – Reinforcement Learning – Unsupervised Learning Neural Networks – Advances in Neural networks.		

<b>UNIT-V</b>	<b>NEURO-FUZZY MODELING</b>	<b>9</b>
Adaptive Neuro – Fuzzy Inference Systems – Coactive Neuro-Fuzzy Modeling – Classification		

and Regression Trees – Data Clustering Algorithms – Rule base Structure Identification – Neuro-Fuzzy Control – Case study : Accident Compensation.

**L:45 T:0 T: 45 PERIODS**

**REFERENCES**

1.	Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, First Edition , Prentice-Hall of India, 2003.
2.	S.Rajasekaran and G.A.Vijaylakshmi Pai , “Neural Networks Fuzzy Logic and Genetic Algorithms”, First edition , Prentice Hall of India,2003.
3.	David E. Goldberg, “Genetic Algorithms in Search, Optimization and Machine Learning”, First Edition , Addison Wesley, 1997.
4.	Mitchell Melanie, “An Introduction to Genetic Algorithm”, First Edition , Prentice Hall, 1998.
5.	S.N. Sivanandam, S. Sumathi and S. N. Deepa, “Introduction to Fuzzy Logic using MATLAB”, Springer, 2007.
6.	James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Education, 2003.

<b>16CS609</b>	<b>INTERNET OF THINGS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT-I</b>	<b>INTRODUCTION</b>	<b>9</b>
Definitions and Functional Requirements –Motivation – Architecture - Web 3.0 View of IoT– Ubiquitous IoT Applications – Four Pillars of IoT – DNA of IoT - The Toolkit Approach for End-user Participation in the Internet of Things. Middleware for IoT: Overview – Communication middleware for IoT –IoT Information Security.		
<b>UNIT-II</b>	<b>IOT PROTOCOLS</b>	<b>9</b>
Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus – KNX – Zigbee Architecture – Network layer – APS layer – Security.		
<b>UNIT-III</b>	<b>WEB OF THINGS</b>	<b>9</b>
Web of Things versus Internet of Things – Two Pillars of the Web – Architecture Standardization for WoT– Platform Middleware for WoT – Unified Multitier WoT Architecture – WoT Portals and Business Intelligence. Cloud of Things: Grid/SOA and Cloud Computing – Cloud Middleware – Cloud Standards – Cloud Providers and Systems – Mobile Cloud Computing – The Cloud of Things Architecture.		
<b>UNIT-IV</b>	<b>INTEGRATED</b>	<b>9</b>



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

<b>UNIT-V</b>	<b>APPLICATIONS</b>	<b>9</b>
The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging.		

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<b>REFERENCES</b>
<ol style="list-style-type: none"> <li>1. The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou – CRC Press – 2012. (Unit I-V)</li> <li>2. Architecting the Internet of Things - Dieter Uckelmann; Mark Harrison; Florian Michahelles - (Eds.) – Springer – 2011. (Unit I-V)</li> <li>3. Networks, Crowds, and Markets: Reasoning About a Highly Connected World - David Easley and Jon Kleinberg, Cambridge University Press – 2010.(Unit IV)</li> <li>4. The Internet of Things: Applications to the Smart Grid and Building Automation by – Olivier Hersent, Omar Elloumi and David Boswarthick - Wiley -2012. (Unit V)</li> <li>5. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012.(Unit I-V)</li> </ol>

### OPEN ELECTIVE OFFERED TO OTHER PG PROGRAMMES

<b>16IT901</b>	<b>GREEN COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
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.		

<b>UNIT II</b>	<b>ENERGY EFFICIENT STORAGE</b>	<b>9</b>
Disk Energy Management-Power efficient strategies for storage system-Dynamic thermal management for high performance storage systems-Energy saving technique for Disk storage systems.		

<b>UNIT III</b>	<b>ENERGY EFFICIENT ALGORITHMS</b>	<b>9</b>
Scheduling of Parallel Tasks – Task level Dynamic voltage scaling – Speed Scaling – Processor		

optimization- Memetic Algorithms – Online job scheduling Algorithms.

<b>UNIT IV</b>	<b>REAL TIME SYSTEMS</b>	<b>9</b>
Multi processor system – Real Time tasks- Energy Minimization – Energy aware scheduling Dynamic Reconfiguration- Adaptive power management-Energy Harvesting Embedded system.		

<b>UNIT V</b>	<b>ENERGY AWARE APPLICATIONS</b>	<b>9</b>
On chip network – Video codec Design – Surveillance camera- Low power mobile storage.		

**L:45 T:0 TOTAL : 45 PERIODS**

<b>REFERENCES</b>	
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:Luro, “Energy Aware computing”, Intel Press,2012
4.	Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2011
5.	Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009.

<b>WEB RESOURCES</b>
<a href="https://www.ncomputing.com/company/green-computing">https://www.ncomputing.com/company/green-computing</a>
<a href="http://www.techopedia.com/definition/14753/green-computing">www.techopedia.com/definition/14753/green-computing</a>
<a href="http://www.computerweekly.com">www.computerweekly.com</a> > Guides

<b>16IT902</b>	<b>NETWORK ON CHIP</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>ICN ARCHITECTURES</b>	<b>9</b>
Introduction - Classification of ICNs - Topologies - Direct networks - Indirect networks- Performance analysis.		

<b>UNIT II</b>	<b>SWITCHING TECHNIQUES</b>	<b>9</b>
Basic switching techniques - Virtual channels - Hybrid switching techniques Optimizing switching techniques - Comparison of switching techniques - Deadlock, live lock and Starvation		

<b>UNIT III</b>	<b>ROUTING ALGORITHMS</b>	<b>9</b>
Taxonomy of routing algorithms - Deterministic routing algorithms - Partially adaptive algorithms - Fully adaptive algorithms - Routing in MINs - Routing in switch-based networks with irregular topologies - Resource allocation policies- Flow control		

<b>UNIT IV</b>	<b>NETWORK-ON-CHIP</b>	<b>9</b>
NoC Architectures - Router architecture - Area, energy and reliability constraints - NoC design Alternatives - Quality-of Service (QoS) issues in NoC architectures		

<b>UNIT V</b>	<b>EMERGING TRENDS</b>	<b>9</b>
Fault-tolerance issues - Emerging on-chip interconnection technologies- 3D NoC- Simulation.		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	J. Duato, S. Yalamanchili, and Lionel Ni, "Interconnection Networks: An Engineering Approach", Morgan Kaufmann Publishers 2004.
2.	William James Dally and Brian Towles, "Principles and Practices of Interconnection Networks", ISBN: 0122007514, Morgan Kaufmann, 2003.
3.	Giovanni De Micheli and Luca Benini, "Networks on Chips: Technology and Tools", ISBN: 0123705215, Morgan Kaufmann, 2006
4.	Natalie Enright Jerger and Li-Shiuan Peh, "On-Chip Networks", Synthesis lectures on computer architecture #8, Morgan and Claypool Publishers 2009
5.	Fayez Gebali, Haytham Elmiligi, Mohamed Wathed and El-Kharashi "Networks-on-Chips: Theory and Practice, CRC Press, 2011.

<b>WEB RESOURCES</b>	
1	<a href="http://www.artemis.com/technology">www.artemis.com/technology</a>
2	<a href="http://nocarc.diit.unict.it/">nocarc.diit.unict.it/</a>
3	<a href="http://www.design-reuse.com/.../a-comparison-of-network-on-chip-and-busses">www.design-reuse.com/.../a-comparison-of-network-on-chip-and-busses</a>
4	<a href="http://www.eng.uci.edu/comp.arch/lab/NoCOverview.htm">www.eng.uci.edu/comp.arch/lab/NoCOverview.htm</a>

<b>16IT903</b>	<b>CLOUD COMPUTING PARADIGMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INTRODUCTION TO CLOUD COMPUTING</b>	<b>9</b>
Introduction to Cloud Computing: Definitions - Central idea - Properties and Characteristics - Benefits - Cloud service and deployment model - Organizational scenario - Architecture - Challenges - Supporting services - Management and administration of Cloud services		

<b>UNIT II</b>	<b>VIRTUALIZATION AND FILE SYSTEM</b>	<b>9</b>
Virtualization Techniques: Virtualization Technology - Overview of x86 virtualization - Types of virtualization - Virtualization products - VLAN - SAN - VM Migration - VM Consolidation and Management - Cloud interoperability standards Cloud File System: Distributed file system - GFS		

<b>UNIT III</b>	<b>CLOUD SOLUTIONS</b>	<b>9</b>
Different Cloud Providers and service comparison: Infrastructure service providers - Comparison between infrastructure service providers - Cloud infrastructure setup procedure - Platform service providers - Cloud platform setup procedure - Cloud application development - Software service - Cloud Database - Cloud programming model - Private cloud computing platforms		

<b>UNIT IV</b>	<b>CLOUD SECURITY - MIDDLEWARE AND TESTING</b>	<b>9</b>
Cloud Security: Fundamentals - Cloud Risk - Security Architecture - VM Security Challenges - Vulnerability assessment tool for cloud - Open source security solution products Cloud Middleware: Need for Cloud Middleware - QoS issues in cloud - Data migration and Streaming - Performance monitoring tools in cloud		

<b>UNIT V</b>	<b>CLOUD APPLICATIONS AND CASE STUDIES</b>	<b>9</b>
Advanced Cloud Applications - Sharing and Collaborative services in cloud - Outside the cloud services - Cloud Analytics - Software plus services - Cloud Content Delivery Network services (CDN) case study - Cloud simulation tools		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Rishabh Sharma, "Cloud Computing Fundamentals, Industry Approach and Trends", Wiley India, 2015.
2.	Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing from Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012
3.	Ronald L. Krutz, Russell Dean Vines, "Cloud Security – A comprehensive Guide to Secure Cloud Computing", Wiley – India, 2010
4.	John W. Rittinghouse and James F. Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010
5.	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'Reilly
<b>WEB RESOURCES</b>	
1.	<a href="http://whatiscloud.com/basic_concepts_and_terminology/cloud">http://whatiscloud.com/basic_concepts_and_terminology/cloud</a>
2.	<a href="http://www.vmware.com/in/virtualization/overview">http://www.vmware.com/in/virtualization/overview</a>
3.	<a href="http://www.csoonline.com/article/2125258/cloud-security/cloud-security--the-basics.html">http://www.csoonline.com/article/2125258/cloud-security/cloud-security--the-basics.html</a>
4.	<a href="http://thecloudtutorial.com/cloudvendors.html">http://thecloudtutorial.com/cloudvendors.html</a>
5.	<a href="http://thecloudtutorial.com/freecloudcomputingapplications.html">http://thecloudtutorial.com/freecloudcomputingapplications.html</a>

<b>16IT904</b>	<b>WEB DESIGNING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>INTRODUCTION : MARKUP WITH HTML</b>	<b>9</b>
HTML & XHTML – markup instructions & Language – Rules of XHTML - HTML Values and Units – Tag Attributes- Text and Comments – Uniform Resource Indicators - Document Structure – Head & Body – Styles Definition – Block Elements – Inline Elements – Organisational Elements – Link – Images - Comments		

<b>UNIT II</b>	<b>ELEMENT HEADER</b>	<b>9</b>
Head – Document Title – Script & Style sections – Document background color and image – Text Structuring –Character Formatting – Lists – Ordered – Unordered – Definition Lists – Links to a web page – Tables – Borders and Rules – Rows and Cells – Formatting with Tables		

<b>UNIT III</b>	<b>FRAMES, FORMS AND MULTIMEDIA</b>	<b>9</b>
Framesets – frame – links to frames – nested framesets – Forms – GET and POST – Form attributes – Textbox – checkbox – radio button – list box – Buttons – Hidden fields – Images – Insert a Image – sizing – image maps – multimedia – animated images & videos – embedding media		

<b>UNIT IV</b>	<b>PRESENTATION WITH CSS</b>	<b>9</b>
Styles and HTML – defining styles – cascading styles – style definitions – understanding selectors – understanding style inheritance – pseudo-class – pseudo-elements – CSS value and units – inheritance and cascade		

<b>UNIT V</b>	<b>FORMATTING WITH CSS</b>	<b>9</b>
CSS Inheritance and cascade – Font properties – Text Formatting – CSS lists – Padding, margin and borders – CSS layouts – CSS positioning – Pseudo-elements and generated content – Dynamic HTML with CSS		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Steven M.Schafer, “HTML, XHTML and CSS”, Wiley Publishing, Inc., Fifth edition 2010.
2.	Chuck Musciano Bill Kennedy, “HTML & XHTML: The Definitive Guide”, O’Reilly, 6th Edition, October 24, 2006
3.	Thomas A. Powell, “Web Design: The Complete Reference”, McGraw Hill, June 2000
4.	Jeffrey C.Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006
5.	Thomas Powell, "HTML & CSS: The Complete Reference", McGraw Hill, Fifth Edition, Mar 2010
6.	Jon Duckett , "Beginning Web Programming with HTML, XHTML, and CSS", Wrox Publications, 2008

<b>WEB RESOURCES</b>
<ol style="list-style-type: none"> <li>1. <a href="http://www.codecademy.com">www.codecademy.com</a></li> <li>2. <a href="http://www.w3schools.com/html/">http://www.w3schools.com/html/</a></li> <li>3. <a href="https://www.khanacademy.org/computing/computer-programming/html-css">https://www.khanacademy.org/computing/computer-programming/html-css</a></li> <li>4. <a href="http://tutorialehtml.com/en/">http://tutorialehtml.com/en/</a></li> <li>5. <a href="http://www.w3schools.com/css/">http://www.w3schools.com/css/</a></li> </ol>

<b>16IT905</b>	<b>PYTHON PROGRAMMING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>UNIT I</b>	<b>DATA, EXPRESSIONS, STATEMENTS</b>	<b>9</b>
<p>Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.</p>		

<b>UNIT II</b>	<b>CONTROL FLOW, FUNCTIONS</b>	<b>9</b>
<p>Conditionals: Boolean values and operators, conditional (if), alternative (if - else), chained conditional (if – elif - else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.</p>		

<b>UNIT III</b>	<b>LISTS, TUPLES, DICTIONARIES</b>	<b>9</b>
<p>Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.</p>		

<b>UNIT IV</b>	<b>FILES, MODULES, PACKAGES</b>	<b>9</b>
<p>Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.</p>		

<b>UNIT V</b>	<b>PYTHON AND MACHINE LEARNING</b>	<b>9</b>
<p>Machine learning – Key Terminology – Tasks of Machine Learning – Classifying with k-Nearest Neighbors – Classifying with distance measurements - Example : a handwriting recognition system – Logic Regression - Classification with logistic regression and the sigmoid function: a tractable step function - Using optimization to find the best regression coefficients - Example: estimating horse fatalities from colic.</p>		

<b>L:45 T:0 TOTAL : 45 PERIODS</b>
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<b>REFERENCES</b>	
1.	Allen B. Downey, ``Think Python: How to Think like a Computer Scientist'', 2 <sup>nd</sup> edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016
2.	Guido van Rossum and Fred L. Drake Jr, —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3.	Peter Harrington, “Machine Learning in Action”, Manning Publication, 2012
4.	Willi Richert , Luis Pedro Coelho, “Building Machine Learning Systems with Python”, Packt Publishing, 2013.
5.	Dave Kuhlman, “A Python Book: Beginning Python, Advanced Python, and Python Exercises”, Open Source MIT License, 2013.

