Integral University, Lucknow
Department of CSE
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Soft Computing, Subject Code: CS-518
w.e.fSession 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Know about the concepts of fuzzy logic, crisp logic, fuzzy relation, fuzzy implication rule
CO 2	Know about the concepts of optimization theory genetic computing, and evolutionary computing.
CO 3	Know about the concepts of the neural network,Single Layer, Multilayer, classifications, Implementation, and training
CO 4	Know about the concepts of classifications, Implementation, and training
CO 5	Know about the concept of hybrid systems, like neuro-fuzzy systems, fuzzy genetic systems, and particle intelligence.

Objective: The course curriculum helps to understand the concepts of fuzzy rule, fuzzy data, crisp rule, crisp data, fuzzy relation, implication, and elaborates the concepts of particle intelligence, swarm intelligence, evolutionary computing, optimalization theory, different kind of neural network, learning theory by neural network, algorithm based computing, probabilistic computing, hybrid system concepts, etc..

UNIT I	Introduction of soft computing: [8] What is Soft Computing, soft computing vs. hard computing, soft computing paradigms, and applications of soft computing. Basics of Machine Learning. Dealing with Imprecision and Uncertainty- Probabilistic Reasoning- Bayesian network, Pearl's Scheme for Evidential Reasoning, Dempster-Shafer Theory for Uncertainty Management, Certainty Factor Based Reasoning	8
UNIT II	Neural Networks: Basics of Neural Networks- Neural Network Structure and Function of a single neuron: Biological neuron, artificial neuron, definition of ANN, Taxonomy of neural net, characteristics and applications of ANN, McCulloch Pitt model, different activation functions, Supervised Learning algorithms- Perceptron (Single Layer, Multi layer), Linear separability, ADALINE, MADALINE, RBF networks , Widrow Hoff, learning rule, Delta learning rule, Back Propagation algorithm, Un-Supervised Learning algorithms- Hebbian Learning, Winner take all, Self Organizing Maps, Adaptive Resonance Theory: Architecture, classifications, Implementation and training. Associative Memory	8
UNIT III	Fuzzy Logic: Fuzzy set theory, Fuzzy set versus crisp set, Crisp relation & fuzzy relations, Fuzzy systems: crisp logic, fuzzy logic, introduction & features of membership functions, Fuzzy rule base system : fuzzy propositions, formation, decomposition & aggregation of fuzzy rules, fuzzy reasoning, fuzzy inference systems, Mamdani Fuzzy Models – Sugeno Fuzzy Models, Adaptive Neuro-Fuzzy Inference Systems Architecture	8
UNIT IV	Optimization: Derivative-based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method, Simulated Annealing, Random Search, Downhill Simplex Search Derivative-free Optimization- Genetic algorithm Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, mutation operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.	8

UNIT V	Evolutionary Computing: Genetic programming (GP), Ant colony optimization (ACO), Particle swarm optimization (PSO), Artificial Immune System (AIS).	8

References:

1. S, Rajasekaran& G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications", PHI Publication.
2. S.N. Sivanandam& S.N. Deepa, "Principles of Soft Computing", Wiley Publications.
3. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, "Neuro-Fuzzy and Soft Computing", Prentice-Hall of India.
4. SAndries P Engelbrecht, Computational Intelligence: An Introduction, Wiley Publications.

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**1**	**2**	**2**	**3**	**1**	**2**	**1**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**2**
CO2	**3**	**2**		**1**	**1**	**2**	**3**	**2**	**2**	**2**	**3**		**3**	**2**	**2**
CO3	**2**	**2**		**2**	**1**	**1**		**2**	**3**	**1**	**1**		**2**	**1**	**2**
CO4	**3**	**2**		**2**	**3**	**1**	**1**	**3**	**2**		**3**		**2**	**3**	**1**
CO5	**1**	**2**	**2**	**3**	**1**	**2**	**1**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**2**
1: Low Association, 2: Average Association, 3: Strong Association															

Integral University, Lucknow
Department of Computer Science and Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Advance Data Structure and Algorithm, Subject Code: CS-516
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Know about the concepts of data structures, their types, design concepts
CO 2	Know about the concepts of recursive equations, working with recursive programs., algorithm analysis.
CO 3	Know about the concepts of graphs and trees and their various traversals and properties.
CO 4	Know about the concepts of approximation algorithms and NP class problems
CO 5	Know about the concept of parallel algorithms and pipelines.

Objective: The course curriculum helps to understand the various data structures and various relationships between different types of data structures. Its major objective is the analysis of algorithms, trees, graphs, traversal techniques, solutions of recursive equations, NP class problems and parallel algorithms.

UNIT I	**Data Structures** Overview of data structures Review of Arrays, sparse matrices, Stacks, Queues, linked lists, doubly linked lists, Applications, dynamic storage management Overview of Advance Data structure Red-Black Trees, AVL Trees and B-Trees	**8**
UNIT II	**Analysis of Algorithms** Algorithms and various analysis models, Analyzing Recursive Programs using various strategies Divide and Conquer Paradigm: Divide and conquer recurrence equations and their solutions, Review of various examples Binary search, Quick sort, merge sort.	**8**
UNIT III	**Graphs & Trees** Basic traversal and search techniques: Game Tree, traversal techniques of graph, connected component and spanning tree, Bi-connected components, AND/OR graph, LOWER BOUND THEORY comparison tree and lower bound through reduction.	**8**
UNIT IV	**Approximation Algorithms** Introduction, absolute approximation, - Approximation, Polynomial time approximation scheme, fully Polynomial time approximation scheme, NP Hard and NP Complete problem basic concept, Cook Theorem, NP Hard graph problems, NP Hard scheduling problems, NP Hard code generating problems.	**8**
UNIT V	**Parallel Algortihms** PRAM Algorithms: Introduction, computational model, fundamental techniques and algorithms, merging and lower bounds MESH Algorithms: computational model, packet routing fundamental algorithm, merging computing the convex hull.	**8**

References:

1. Fundamental of computer algorithms-Ellis Horowits, Sartaj Sahani,Saguthevar Rajasejaran (Universities press) second Edition
2. The design and analysis of Computer algorithms- Aho, hopcraft &ulman (Pearson Education)
3. Introduction to Algorithms- Thomas H. Coremen, Charles S. Lieserson, Ronald L Rivest and Clifford Stein (PHI)-2 nd edition

4. Randomized Algorithms- Rajiv Motwani and Prabhakar Raghavan (Cambridge University Press)
5. Algorithm Design Foundation analysis and Internet examples-Michael T. Goodrich, Roberto Tamassia (Wiley student Edition)

CO-PO/PSO MAPPING

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	3	1	2	2	3	1	2	1	2	1	2	3
CO2	3	1	1	1	1	2	1	2		2	3	1			2
CO3	1	3	3	2	1			2		1	1	2	2	1	3
CO4	4	2			3	1	3	3		2	3	3	2		2
CO5	3	4	1	3	1	2	3	3	1	2	1	2	1	2	3
1: Low Association, 2: Average Association, 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Data Communication & Computer Network, Subject Code: CS-514
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

COURSE OUTCOME (CO)	DESCRIPTION	Bloom's Taxonomy Level
CO 1	To understand the transmission media and type of switching.	Knowledge (level1)
CO 2	To analyze different networking functions and features of data link protocols and sliding window protocol.	Understand (level 2)
CO 3	To apply different networking concepts for implementing network solution.	Understand (level 2) Apply (level 3)
CO 4	To evaluate and implement routing algorithms for implanting solution for the real-life problems.	Analyze (level 4) Evaluate (level 5)
CO 5	To implement model of fault tolerant computer networks.	Apply (level 3) Evaluate (level 5)

COURSE OBJECTIVES :

- to give the knowledge of TCP/IP protocol.
- to give the knowledge of packet switching and message switching.
- to give the knowledge of sliding window protocol.
- to give the knowledge of the CDMA.
- to give the knowledge of network layer protocols viz. IPv4, ARP, RARP.
- to give the knowledge of routing.
- to give the knowledge of TCP & UDP.
- to give the knowledge of congestion control.
- to give the knowledge of quality of service.
- to give the knowledge of DNS, FTP, TELNET and remote logging.

UNIT I	**Network Models (ISO-OSI and TCP/IP):**	**8**
	Need & Comparison of network models (ISO-OSI and TCP/IP), Transmission Impairments: Attenuation, Distortion, Noise. Data Rate: NBR, Shannon Capacity. Network Performance: Bandwidth, Throughput, Delay, Jitter. Switching: Circuit switching, Packet switching, Virtual Circuit. Introduction to flow control, Error Control, Error detection and correction, multiplexing. HDLC-Configurations and transfer modes, frames, Control Field, Segment format.	
UNIT II	**Network Layer:**	**8**
	Network layer - connection devices, IP Addressing, Classful addressing, classless addressing. Features & comparison of IPv4 and IPv6. Routing algorithms and protocols, direct versus indirect delivery, forwarding techniques, Unicast routing protocols -optimization, intra and inter domain routing, distance vector routing, link state routing, path vector routing. Multicast routing protocols – Unicast, multicast and broadcast, Applications Multicast routing. Network layer protocol: ARP, RARP.	
UNIT III	**Transport Layer:**	**8**
	Transport layer-User datagram protocol (UDP)-segment format, Well-known port for UDP, checksum, UDP Operation, Use of UDP. TCP - TCP Segment format, TCP Services, TCP features, TCP connection Establishment & release, TCP half close, TCP simultaneous close, TCP timers, TCP data flow, TCP timeout and retransmission.	
UNIT IV	**Congestion Control:**	**8**

	Congestion control - data traffic descriptor, traffic profile, congestion - network performance, open-loop & close loop congestion control. Quality of services - flow characteristics, flow classes, techniques to improve QoS-Scheduling, Traffic Shaping, Resource reservation Admission control. Security-services - message confidentiality, message authentication, message non-repudiation, message confidentiality: confidentiality with symmetric key cryptography, Confidentiality with asymmetric key cryptography, message and message digest.	
UNIT V	**Application Layer:**	**8**
	Application layer- Domain name system: Name space, Domain name space, Distribution of domain name space, Resolution of Domain names. Segment format and working of DNS, FTP, TELNET, TFTP. Electronic mail: SMTP, IMAP and POP3 protocols.	

References:

1. Forouzen, "Data Communication and Networking", TMH 4th Edition
2. A.S.Tanenbaum,"Computer Networks",3rd Edition,Prentice Hall India,1997.
3. W.Stallings,"Data and Computer Communication",Macmillan Press,1989.
4. W. Richard stevens, "TCP/IP Illustrated Vol 1 ", Addition Wesley
5. Kurose and Ross, "Computer Network – A Top-down approach".

CO-PO MAPPING:

PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	1	1	3				1		3	2		
CO2	3	3	3	2	1	1		1				2		3	3
CO3	3	2	1	1	2	2	3		2			3	1		
CO4	3	2	2	2	3	3				1		2	4		3
CO5	3	1	1	1	1	2	1					2		3	
1: Low Association, 2: Average Association, 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Advance Software Engineering and Project Management
Subject Code: CS-517
w.e.f. Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
Software Engineering	None	3	1	0	4

CO 1	Overview of Basic and Advance Software Engineering.
CO 2	Have knowledge of Design Principles and Advance Software Design.
CO 3	Apply, analyze and compare effort estimation and different network planning models.
CO 4	Analysis of Software Testing and Quality Assurance and K-Metrics.
CO 5	Comparison and analysis of Advance Concepts of Software Development.

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UNIT I	**Introduction** Process models and their evolution- NATO 1968, Waterfall model, Spiral model, Agile Manifesto, Agile Process and Principles, Extreme programming, Scrum, Rational Unified Process, CMM,CMM-I, PCMM,ISO12207, Critical Analysis of Process models.	**8**
UNIT II	Software Design – Design principles, Software architecture, Design Patterns, User Interface Design, Object Oriented Design with UML, Universal design applied to software engineering, Design for Reuse.	**8**
UNIT III	Programming Paradigms – Imperative programming, Functional programming, Logical programming, Object oriented programming, Global Software Development- tools and practices, Coding Standards, Aspect Oriented Software Engineering.	**8**
UNIT IV	Software Testing and Quality Assurance – Testing processes, Testing tools, ISO Quality Models- ISO 9001 and ISO 9126, Usability Testing, Test Driven Software Development, Object Oriented Testing with C and K-Metrics, Software Configuration Management.	**8**
UNIT V	Introduction,Contract&TechnicalprojectManagement,Activities,Plans,Methods,Methodologies,objectives,business case, Success, failure, Management control, Traditional vs Modern project management, Project portfolio management, Project evaluation, Cost-benefit evaluation Techniques, Risk Evaluation, Resource allocation, Strategic management, Benefits, Step Wise Project Planning.	**8**

References:

1. RogerSPressman,SoftwareEngineering,7thedition,TMHpublication
2. IanSommerville,SoftwareEngineering,9thedition,PearsonEducation
3. Rumbaugh, Object–Oriented Modeling and Design, Pearson Education
4. Jeff Tain, Software Quality Engineering, IEEE publication
5. Research Papers

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3	1	1	1	1	1	3	1	2	2
CO2	3	3		2	1	1	1	1	1	1	1	2	3		1
CO3	3	2		1	2	3	1				1	3	2		2
CO4	3	2	2	2	2	2	1	1	1	1	1	2	3	2	3
CO5	3	1	1	1	1	1	3	1	1	1	1	2	1	2	2
1: Low Association, 2: Average Association, 3: Strong Association															

SOFT COMPUTING LAB
COURSE CODE: CS 519
COURSE CREDIT: 1

Pre-requisite	Co-requisite	L	T	P	C
None	None	0	0	2	2

COURSE OBJECTIVES:

- Artificial Intelligence, Various types of production systems, characteristics of production systems.
- Neural Networks, architecture, functions and various algorithms involved.
- Fuzzy Logic, Various fuzzy systems and their functions.
- Genetic algorithms, its applications and advances.

Syllabus:

1. Exposure to Scilab Script &Functions.
2. Write a program for Recursion inScilab.
3. Write a program in Scilab for decision control andloops.
4. Write a program in Scilab for surfaceplots.
5. Write a program in Scilab for FileHandling.
6. Find whether the given matrix is (a) reflexive (b) tolerance and (c) transitivity matrix or not by writing a Scilabprogram.
7. Find whether the given matrix is symmetry or not by writing a Scilabprogram.
8. Write aprograminScilab tocalculateunion,intersection,complement anddifferenceoftwo fuzzysets.
9. Find the fuzzy relation between two vectors R and S, Using max–product and max-min method by writing aScilabprogram.
10. Illustrate different types of generalized bell membership functions using Scilabprogram
11. DesignnetworksofMcCulloch-PittsneuronsthatimplementlogicalNOT,ANDandORgates.Draweachnetwork and label all the weight and thresholdvalues.
12. WriteaprogramofPerceptronTrainingAlgorithm.
13. Write a program to implement deltarule.
14. WriteaScilabprogramforHebbnettoclassifytwodimensionalinputpatternsbipolarwiththeirtargetsgiven „*‟ indicates a „+1‟ and „.‟ Indicates „-1‟.
15. Implement Classical Genetic Algorithm inScilab.
16. Write a Scilab program for Linear & Quadraticoptimization.

COURSE OUTCOMES (CO):

After completion of the course, a student will be

CO 1	1. Learn about soft computing techniques and their applications
CO 2	2. Analyze various neural network architectures
CO 3	3. Understand perceptrons and counter propagation networks.
CO 4	4. Define the fuzzy systems
CO 5	5. Analyze the genetic algorithms and their applications.

CO-PO MAPPING:

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	1	1	1	1	1	**3**	3	-	-
CO2	3	3	3	3	3	3	3	1	1	1	1	**3**	-	-	-
CO3	3	3	3	3	3	3	**3**	1	1	1	1	3	-	2	-
CO4	**3**	3	3	3	3	1	1	1	1	1	1	3	3	-	-
CO5	**3**	3	3	3	3	**-**	1	-	1	1	1	3	3	-	2
1: Low Association, 2: Average Association, 3: Strong Association															

Data Communication and Computer Networks Lab
COURSE CODE: CS 515
COURSE CREDIT: 1

Pre-requisite	Co-requisite	L	T	P	C
Computer Networks	**None**	**3**	**1**	**0**	**4**

CO 1	Simulation of ALOHA, CSMA and CSMA/CD
CO 2	Simulation of Data Link Layer Protocols
CO 3	Simulation of Application Layer Protocols
CO 4	Experiments related to LAN and MAN
CO 5	Implementation of ALOHA, CSMA and CSMA/CD in C.

SECTION – A (Study of LAN Trainer Kit)

(A) MACLAYER

1. Simulate ALOHA protocol for packet transmission between a no. of Nodes connected to a commonbus.
2. Simulate CSMA protocol for packet transmission between a no. of Nodes connected to a commonbus.
3. SimulateCSMA/CDprotocolforpackettransmissionbetweenano.ofNodesconnectedtoacommonbus.
4. SimulateTOKENBUSforbusLAN.
5. SimulateTOKENBUSforringLAN.

(B) DATA LINKLAYER

1. Simulate PACKET TRANMISION from one Node to anotherNode.
2. Simulate SLIDING WINDOW protocol to provide reliable data transfer between two nodes over an unreliableNetwork.
3. Simulate STOP & WAIT protocol for packet transmission between a no. ofnodes.

(C) APPLICATIONLAYER

1. Simulate FILE TRANSFER protocol to check transfer of file and deceiving of file between two nodes.

SECTION – B (Study of Network Simulator)

(A) LANEXPRIMENTS

1. Simulation of network based on Pure Aloha protocol usingnetsim.
2. Simulation of network based on Slotted Aloha protocol usingnetsim.
3. Simulation of network based on Ethernet protocol usingnetsim.
4. Simulation of network based on Token Bus protocol usingnetsim.
5. Simulation of network based on Token Ring protocol usingnetsim.

(B) WANEXPRIMENTS

1. Simulation of network based on Router usingnetsim.
2. Simulation of network based on Frame relay usingnetsim.
3. SimulationofnetworkbasedonX.25usingnetsim.
4. Simulation of network based on TCP (Transfer Control Protocol) usingnetsim.
5. Simulation of network based on UDP (User Datagram Protocol) usingnetsim.
6. Simulation of network based on ATM (Asynchronous Transfer Mode) usingnetsim.

(C) 'C'PROGRAMS

1. WAP to implement TOKEN RINGprotocol.
2. WAP to implement ALOHAprotocol.
3. WAP to implement CSMA/CD protocol for a singlechannel.
4. WAP to implement CSMA/CD protocol for a doublechannel.

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**	**2**	**1**	**1**	**3**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**2**	**2**

CO2	**3**	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**2**	**1**
CO3	**3**	**2**	**1**	**1**	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**3**	**2**	**1**	**2**
CO4	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**3**	**2**	**3**
CO5	**3**	**1**	**1**	**1**	**1**	**1**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**2**	**2**
1: Low Association, 2: Average Association, 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Advanced Distributed Operating System, Subject Code: CS-520
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO1	Elucidate the foundations and issues of distributed systems
CO2	Understand the various synchronization issues and global state for distributed systems.
CO3	Understand the Mutual Exclusion and Deadlock detection algorithms in distributed systems.
CO4	Describe the agreement protocols and fault tolerance mechanisms in distributed systems.
CO5	Describe the features of peer-to-peer and distributed shared memory systems

Objective:

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributed systems.
- To learn distributed mutual exclusion and deadlock detection algorithms.
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
- To learn the characteristics of peer-to-peer and distributed shared memory systems

UNIT I		**9**
	Advanced Operating Systems: Overview and architecture, Distributed computing models and their comparison, Client Server Models: addressing, architecture, implementation. Case Study.' World Wide Web 1.0 Interprocess Communication: API for internet protocol, Marshalling. Client server communication, group communication Case Study.' CBCAST protocol in ISIS.	
UNIT II		**8**
	Distributed objects and remote invocation: communication between Distributed objects, RPC, events and notification Case Study: Java RMI Operating System Support: Operating System layer. Protection , processes ands threads, operating system architecture Distributed clock synchronization: physical clock , logical clock.	
UNIT III		**8**
	Distributed File System: Models, service interface and directory interface design, DFS system structure, Case Study: Google file system. Security in distributed systems: problems and design issues, Faulttolerance and recovery: basic concepts, faultmodels, agreement problems andits applications, commit protocols, voting protocols, checkpointing and recovery.	
UNIT IV		**8**
	Distributed Multimedia systems: Characteristics of multimedia, multimedia data. Quality of service management, resorce management, stream adaptation. Case Study: Tiger video file server. Distributed shared memory: design and implementation issues, sequential consistency and Ivy. Case Study: Munin	
UNIT V		**9**
	Real time distributed operating system: Design issues, distributed communicatins in LAN and WAN, scheduling: static and dynamic, scheduling algorithms, Case Study: MARS. Emerging trends in distributed computing: Introduction, Grid computing-architeture application, SOA overview, design, service oriented grid, advantages and future scope, Cloud computing- feature and architecture.	

References:

1. **Distributed Systems — Coulouris [Pearson Education]**
2. **Distributed Operating Systems- Tannenbaum [Pearson Education]**
3. **Distributed Systems:Principles andParadigms —Tannenbaum[Pearson**

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**2**	3	**2**	–	–	–	–	–	–	–	–	–	**2**	_	_
CO2	3	3	**2**	–	–	–	–	–	–	–	–	–	**3**	**1**	2
CO3	3	3	**2**	_	–	–	–	–	–	–	–	–	**3**	1	2
CO4	**2**	3	**2**	**-**	–	–	–	–	–	–	–	–	**3**	1	2
CO5	3	3	**2**	_	–	–	–	–	–	–	–	–	**3**	3	2
1: Low Association, 2: Average Association, 3: Strong Association															

Integral University, Lucknow
Department of CSE
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: advanced computer architecture, Subject Code: CS 522
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Know about the concepts of computer architecture, computer design, high-performance computer
CO 2	Know about the concepts of performance metrices parallel computer, and advanced processor technology.
CO 3	Know about the concepts of memory, memory hierarchy, network memory,
CO 4	Know about the concepts of RAID, various interconnection network
CO 5	Know about the concept of pipeline, pipeline designing, linear and non linear pipilene

Objective: The objective of this course is to analyze parallel computing and parallelism at various levels of the job, identify the various conditions of parallelism, and elaborated the various interconnection network. It also focuses on identifying the pipeline hazards,latency in pipeline collision vector.

UNIT I	Fundamentals of Computer design, state of computing, parallel computing, parallel computing model, multiprocessor and multi computer. Parallel architecture classification scheme, Performance metrics and measures, scalability analysis and approach, speedup performance law, parallel processing application, quantitative principles of computer design	8
UNIT II	Advanced processor technology, superscalar and vector processor, Instruction level parallelism (ILP)- over coming data hazards- reducing branch costs – high performance instruction delivery hardware-based speculation- limitation of ILP, ILP software approach- compiler techniques static branch prediction- VLIW approach- H.W support for more ILP at compile time- H.W verses S.W solutions.	8
UNIT III	Memory hierarchy design- cache memory organization, cache performance, reducing cache misses' penalty and miss rate, virtual memory technology, protection and examples of VM. Backplane bus system, symmetric shared memory architectures-distributed shared memory Synchronization- multi threading	8
UNIT IV	Storage systems- Types – Buses - RAID- errors and failures- bench marking a storage device designing an I/O system. Inter connection networks and clusters, network properties and routing, static connection network, dynamic connection network	8
UNIT V	Introduction to High Performance Computing: Overview, Pipeline v/s Parallel Processing Parallel Architectures Performance. Pipeline Processing: Pipeline performance, design of arithmetic pipelines, multifunction pipes, concept of reservation table, collision vector and hazards. Instruction Processing Pipes: Instruction and data hazard, hazard detection and resolution.	8

References:

1. Computer Architecture A quantitative approach 3rd edition John L. Hennessy & David A. Patterson Morgan Kufmann (An Imprint of Elsevier) 2. " Computer Architecture and parallel Processing" Kai Hwang and A. Briggs International Edition McGraw-Hill.

3. Advanced Computer Architectures, Dezso Sima, Terence Fountain, Peter Kacsuk, Pear son.

4. Advance computer architecture ,Kai Hwang, Tata Mc Graw hill

Prerequisite – None Corequisite – None

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**3**	**3**	**2**	**3**	**3**					**2**	**1**	**2**	**2**	**3**	**4**
CO2	**1**	**3**	**4**	**2**	**1**	**4**		**1**	**1**	**2**	**2**	**1**			**3**
CO3	**3**	**3**	**3**	**1**	**1**	**1**				**2**	**2**	**2**	**2**	**2**	**3**
CO4	**1**	**2**	**1**	**2**	**4**	**2**	**2**	**3**	**2**	**2**			**1**	**2**	**1**
CO5	**3**	**1**	**1**	**2**	**1**	**2**	**1**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**2**
1: Low Association, 2: Average Association, 3: Strong Association															

Integral University, Lucknow
Department of CSE
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Pattern Recognition, Subject Code: CS 523
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Implementation of pattern recognition and machine learning theories.
CO 2	Designing and implementing certain important pattern recognition techniques.
CO 3	Applying the pattern recognition theories to applications of interest.
CO 4	Implementation of the entropy minimization, clustering transformation and feature ordering
CO 5	Knowledge about the curse of dimensionality and various methods of dimensions reduction

Objective:

1.To implement pattern recognition and machine learning theories.
2.To design and implement certain important pattern recognition techniques.
3.To apply the pattern recognition theories to applications of interest.
4.To implement the entropy minimization, clustering transformation and feature ordering.
5. To introduce the curse of dimensionality and various methods of dimensions reduction

Syllabus

UNIT I	INTRODUCTION-Basic concepts, Applications, Fundamental problems in pattern Recognition system design, Design concepts and methodologies, Examples of Automatic Pattern recognition systems, Simple pattern recognition model. DECISION AND DISTANCE FUNCTIONS -Linear and generalized decision functions, Pattern space and weight space, Geometrical properties, implementations of decision functions, Minimum-distance pattern classifications.	8
UNIT II	PROBABILITY -Probability of events: Random variables, Joint distributions and densities, Movements of random variables, Estimation of parameter from samples. STATISTICAL DECISION MAKING- Introduction, Baye's theorem, Multiple features, Conditionally independent features, Decision boundaries, Unequal cost of error, estimation of error rates, the leaving -one-out-techniques, characteristic curves, estimating the composition of populations. Baye's classifier for normal patterns.	8
UNIT III	NON PARAMETRIC DECISION MAKING -Introduction, histogram, kernel and window estimation, nearest neighbour classification techniques. Adaptive decision boundaries, adaptive discriminate functions, Minimum squared error discriminate functions, choosing a decision making techniques. CLUSTERING AND PARTITIONING- Hierarchical Clustering: Introduction, agglomerative clustering algorithm, the single -linkage, complete-linkage and average -linkage algorithm. Ward's method Partition clustering-Forg's algorithm, K-means's algorithm, Isodata algorithm.	8

UNIT IV	PATTERN PREPROCESSING AND FEATURE SELECTION: Introduction, distance measures, clustering transformation and feature ordering, clustering in feature selection through entropy minimization, features selection through orthogonal expansion, binary feature selection.	8
UNIT V	SYNTACTIC PATTERN RECOGNITION & APPLICATION OF PATTERN RECOGNITION Introduction, concepts from formal language theory, formulation of syntactic pattern recognition problem, syntactic pattern description, recognition grammars, automata as pattern recognizers, Application of pattern recognition techniques in bio-metric, facial recognition, IRIS scon, Finger prints, etc.	8

TEXT BOOKS:

1. Gose. Johnsonbaugh. Jost. " Pattern recognition and Image Analysis", PHI.
2. Tou. Rafael. Gonzalez. "Pattern Recognition P
rinciple", Pearson Education

REFERENCE BOOK:

1. Richard duda, Hart, David Strok, "Pattern Classification", John Wiley.
2. Digital Image Processing, M.Anji Reddy, Y.Hari Shankar, BS Publications.

CO-PO Mapping:

PO	PO											PSO			
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO 10	PO 11	PS O1	PSO 2	PS O3	PS O4
CO1	3	1	2	3	1	3	1	2	1	1	2	3	1		
CO2	3	1	2	3	1	1			2		2	3	2		
CO3	3	1	2	3	2	2	3		1		3	3	2	3	
CO4	3	1	2	3	3	3					2	3	1	3	
CO5	3	1	2	3	1	2	1				2	3	2		3
1: Low Association, 2: Average Association, 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Software Testing & Quality Management, Subject Code: CS-524
w.e.f. July 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

CO 1	Develop and manage test plan as per the software testing guidelines.
CO 2	Apply software testing techniques to uncover errors.
CO 3	Develop test cases on the basis of different testing strategies.
CO 4	Plan, assess and improve the quality of software.
CO 5	Work on standard quality models.

Objective:

1. To understand and describe software testing in general.
2. To understand various testing techniques.
3. To understand various software testing strategies.
4. To identify the role of software testing in software quality improvement.

UNIT I	**Introduction to Software Testing** Evolution, Myths, Facts, Goals, Psychology, Models, Principles , Axiom of Testing, Study of Bugs: Classification, Priority, Severity and their tracking .Software Testing: Terminology, Life cycle, Methodology, Types of Testing, Test planning: Test Plan Specification, Leveled Test Plan, Development of Test Plan ,Master Test plan ,Phase Wise Test Plan, Test management, Software Testing Guidelines, Defect Management, Analyzing & Reporting Test.	**8**
UNIT II	**Testing Technique** Static Testing: Inspection, Structured Walkthrough, Technical reviews, Automated Techniques ,Black box testing, Types of Black box Testing: Requirement based Testing, Positive & Negative Testing, Boundary Value Analysis, Compatibility Testing, Domain Testing, Graph Based Testing, Robustness Testing , Syntax Testing, Finite State Testing, CauseEffect Graphing Based Testing. White Box Testing, Types of White box Testing: Basis Path Testing, Control Structure Testing, Mutation Testing, and Gray Box Testing. Software Testability, Software Test Automation, Test Metrics and its Measurements.	**8**
UNIT III	**Software Testing Strategies** Model for Software Testing, Unit Testing, Integration, System & Acceptance Testing: Alpha Testing, Beta Testing, Stress testing, Load testing, Reliability Testing, Scalability Testing . Performance Testing, Regression Testing, Ad-hoc Testing, Usability and Accessibility Testing, Object Oriented Testing: Object-Oriented Testing Model, Object-oriented Software Test Strategy.	**8**
UNIT IV	**Introduction to Software Quality** Concepts of quality, perspectives and expectations, Quality Framework, Quality engineering: Activity and process, Quality planning, Quality assessment and improvement. Quality assurance: Classification, Q.A activities, Q.A. Techniques, Defect prevention and process improvement, Software Inspection, Formal Verification, Introduction to Software Reliability Engineering, Software Quality Measurement & Metrics.	**8**
UNIT V	**Quality Models** McCall's model, Bohem's model, Dromey's model, FURPS Model,ISO-9126 Model, Cost Of Quality, Software Quality Factors, Quality Control , CMMI-Framework : Process Area Components, Capability & Maturity Levels, Relationship Among Process Areas.	**8**

References:

1. Software Testing : K.Mustafa,R.A. Khan ,Narosa
2. Software Testing : Srinivasan Desikan,Pearson
3. Software Testing : Naresh Chauhan , Oxford
4. Software Quality Engineering : Jeff Tian ,Wiley
5. Software Testing Fundamentals: Marnie L.Hutcheson,Wiley
6. Software Testing : Ron Patton, Pearson

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2			1				3						1
CO2			3			2					2			
CO3									1			2		
CO4	3			2							1		3	
CO5	1	2				1			2					
1: Low Association, 2: Average Association, 3: Strong Association														

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Advance Concepts of Database Design, Subject Code: CS-525

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

CO 1	Know about the concepts of indexing, query processing & query optimization. Evaluation of expressions and cost estimation.
CO 2	Have knowledge about database tuning and concept building of object oriented database systems and the terminologies used.
CO 3	Know about the distributed database systems, their types, data fragmentation, data replication, deadlock handling and concurrency control techniques used in distributed databases.
CO 4	Know about database security threats, issues, role of DBA, database audits and discretionary access control.
CO 5	Have knowledge about enhanced data models (active databases, temporal databases, statistical databases, & multimedia databases) for advanced applications.

Objective:

- To give the knowledge of Advance SQL Queries, which help the student to learn the working of internal processing of DBMS and how the underlying queries compute.
- To give the knowledge about database tuning and object oriented database concepts
- To give knowledge and understandings of distributed databases.
- Explain basic issues of database security and how to built secure databases.
- To give the knowledge about the working of emerging databases.

UNIT 1	**Indexing** – Primary & Secondary Index, Multilevel Indexing, B tree Indexing, B+ tree indexing, Hashing- Static & dynamic. **Query Processing-** Measures of query cost, selection operations, Join operations, Evaluation of expressions-Materialization, Pipelining. **Query Optimization-** Introduction, generating equivalence relation, Transformation of relational expression- equivalence rules, Choice of evaluation plans, Cost estimation-cost based optimization, Heuristic optimization, Statistical Information for Cost Estimation.	**8**
UNIT II	**Database Tuning-** Database workload, Physical design and tuning decisions, Need for database tuning, Index selection, Tuning Indexes, Tuning the conceptual schema, Tuning queries and views, DBMS Benchmarks. **Object Oriented Database System-** properties, need for OODBMS, Structured types, Inheritance, Multiple Inheritance, Object identity, Object containment, Nested Relational Model.	**8**
UNIT III	**Distributed Database System-** Heterogeneous and Homogeneous Databases, Distributed Data Storage –Data replication, Data fragmentation, Distributed Transactions, Concurrency Control in Distributed Databases Commit Protocols –Two-Phase commit, Three- Phase commit, Deadlock handling, Distributed Query Processing In R * System .	**8**
UNIT IV	**Database Security-** Database Security and Authorization, Introduction to Database Security Issues, Types of Security, Database Security and DBA, Access Protection, User Accounts, and Database Audits Access Control and Grant & Revoke on Views and Integrity Constraints, Discretionary Access Control, Role of DBA, Security in Statistical Databases.	**7**
UNIT V	**Enhanced Data Model for Advanced Applications-** Active database concept and triggers and their design and implementation issues, Temporal data base concepts, Spatial and multimedia databases, Introduction to deductive databases, introduction to expert database system.	

REFERENCES

1. Korth, Silberchatz, Sudarshan, "Database Concepts", Addison Wesley.

2. Majumdar & Bhattacharya, "Database Management System", TMH.
3. Elmastri, Navathe, "Fundamentals of Database Systems", Addison Wesley.
4. Date C.J., "An Introduction to Database System", Addison Wesley.
5. Ramakrishnan, Hadzilacous, Goodman, "Concurrency Control & Recovery", Addiosn Wesley.
6. Ceri & Palgatti, "Distributed Databases", McGraw Hill.

CO-PO/PSO MAPPING

PO	PO												PSO			
CO	POI	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	2	1	3			2	1		3	1	3	2	3
CO2	3	3	1	2	1	2		1				1	1	2	2	3
CO3	3	3	2	1	2	2		3	2			3	1	2	1	3
CO4	3	3	3	2	3	3				1		2	3	2	1	1
CO5	3	3	1	1	1	2	1					3	2	1	3	1
1: Low Association, 2: Average Association, 3: Strong Association																

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Advance cryptography and Network Security, Subject Code: CS-526
w.e.f. July 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

UNIT I	**Introduction and Mathematical Foundations:** Introduction, Overview on Modern Cryptography, Number Theory,Probability and Information Theory. **Classical Cryptosystems:** Classical Cryptosystems, Cryptanalysis of Classical Cryptosystems, Shannon's Theory.	8
UNIT II	**Symmetric Key Ciphers:** Modern Block Ciphers (DES), Modern Block Cipher (AES) **CryptanalysisofSymmetricKeyCiphers:**LinearCryptanalysis,DifferentialCryptanalysis,OtherCryptanalyticTechniques, Overview on S-Box Design Principles, Modes of operation of Block Ciphers. Key distribution.	8
UNIT III	**Stream Ciphers and Pseudorandomness:** Stream Ciphers, Pseudorandom functions. **Hash Functions and MACs:** Hash functions: The Merkle Damgard Construction, Message Authentication Codes	8
UNIT IV	**AsymmetricKeyCiphers:ConstructionandCryptanalysis:**MoreNumberTheoreticResults,TheRSA Cryptosystem,Primality Testing, Factoring Algorithms, Other attacks on RSA and Semantic Security of RSA, TheDiscreteLogarithmProblem(DLP)andtheDiffieHellmanKeyExchangealgorithm,TheElGamalEncryptionAlgorithm, CryptanalysisofDLP	8
UNIT V	**Digital Signatures:**Signature schemes. **Modern Trends in Asymmetric Key Cryptography:** Elliptic curve basedcryptography, **NetworkSecurity:**SecretSharing Schemes, ATutorial on NetworkProtocols, Kerberos, PrettyGood Privacy(PGP),SecureSocketLayer(SSL),IntrudersandViruses,Firewalls.	8

[8]

References:

1. WilliamStallings,"CryptographyandNetworkSecurity:PrinciplesandPractice"PrenticeHall,NewJersey
2. . Johannes. A. Buchmann, "Introduction to cryptography", Springer Verlag. Bruce Schiener, "AppliedCryptography".
3. Behrouz A. Forouzan, "Cryptography & Network Security" , TMH

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Advance Concepts Real Time System, Subject Code: CS-527

Pre-requisite	Co-requisite	L	T	P	C
None	None	3	1	0	4

UNIT I	**Introduction-** Definition, Structure, Typical Real Time Applications: Digital Control, High Level Controls, SignalProcessing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real TimeSystems, Reference Models for Real Time Systems: Processors and Resources, Periodic Task Model, Critical and Non-critical tasks Precedence Constraints.	8
UNIT II	**Real Time Scheduling of Uni- processor systems-** Common Approaches to Real Time Scheduling: Clock DrivenApproach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems. ClassicalUniprocessorSchedulingAlgo-RateMonotonic,EDF,UniprocessorSchedulingofIRISTasks:IdenticalandNononidentical Linear & Concave Reward Function, 0/1RewardFunction.	8
UNIT III	**Real Time Scheduling of Multi- Processor systems-** Multiprocessor and Distributed System Model, Bin- PackingAssignmentAlgorithmforEDF,Next-FitAlgorithmforRMScheduling,MyopicOfflineScheduling,FABAlgorithm& BuddyStrategy. **Real Time Database:** Real Time vs. General purpose Database, Main Memory database, Concurrency Control Issues.	8
UNIT IV	**Real Time Operating Systems-** An overview of RTOS, Real Time Threads, Tasks & Kernels, Case Study of QNX,VRTX, Vx Works. **Fault Tolerance in Real Time Operating Systems**- Introduction to Fault, Fault Detection and Error Containment,Redundancy,DataDiversity,ReversalChecks,Malicious&IntegratedFailureHandling.ClockSynchronization:IntroductiontoClocks.	8
UNIT V	**Real Time Communication**- Model of Real Time Communication, Medium Access Control Protocols for BroadcastNetworks,InternetandResourceReservationProtocols,RealTimeProtocols,VTCSMA,CommunicationinMulticomputer System,N/WTopologies.	8

REFERENCE

1. C.M. Krishna & Shin, “Real Time Systems”, Mc Graw Hill1985.
2. Jane W.S. LIU, “Real Time Systems”, PearsonEducation”.
3. Levi & Agarwal, “Real Time System”, McGrawHill.
4. Mall Rajib, “Real Time Systems”, Pearson

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Forensic & Cyber Crime, Subject Code: CS-528
w.e.f. July 2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

Course Outcome	
CO1	Demonstrate competency in the principles of crime scene investigation, including the recognition, collection, identification, preservation, and documentation of physical evidence.
CO2	Underline the need of digital forensic and role of digital evidences. List the method to generate legal evidence and supporting investigation reports and will also be able to use various digital forensic tools.
CO3	Explain the methodology of incident response and various security issues in ICT world, and identify digital forensic tools for data collection
CO4	Demonstrate the ability to document and orally describe crime scenes, physical evidence, and scientific processes.
CO5	Identify and examine current and emerging concepts and practices within the forensic science field.

Objective:

- To understand underlying principles and many of the techniques associated with the digital forensic practices and cyber crime.
- To explore practical knowledge about ethical hacking methods.
- To learn the importance of evidence handling and storage for various devices.
- To develop an excellent understanding of current cyber security issues (Computer Security Incident) and analyzed the ways that exploits in securities.
- To investigate attacks, IDS .technical exploits and router attacks and "Trap and Trace" computer networks.
- To apply digital forensic knowledge to use computer forensic tools and investigation report writing.

Syllabus:

UNIT I		**8**
	Cyber Forensic Basics - Introduction to Cyber Forensics, Storage Fundamentals, File System Concepts, Operating System Software and Basic Terminology, Introduction to Encase Forensic Edition, Analysis and Advanced Forensic Tool Kit. Forensic Technology and Practices, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Network Forensics.	
UNIT II		**10**
	Cyber Crimes and Cyber Laws- Introduction to IT laws & Cyber Crimes – Unauthorized Access to Computers, Computer Intrusions, White collar Crimes, Viruses and Malicious Code, Internet Hacking and Cracking, Virus Attacks, Pornography, Software Piracy, Mail Bombs, Exploitation, Stalking and Obscenity in Internet. Information Technology Act, 2000. Intellectual Property Right, Penalties Under IT Act Offences, Digital Signature and Electronic Signature Under IT Act Statutory Provisions Establishment of Authorities and their functions, Certifying Authorities & Cyber Regulation Appellate	

UNIT III		**8**
	Cyber Forensics Investigation- Introduction to Cyber Forensic Investigation, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Encryption and Decryption methods, Search and Seizure of Computers, Recovering deleted evidences, Password Cracking.	
UNIT IV		**8**
	Data and Evidence Recovery :Data Recovery, Introduction to Deleted File Recovery, Formatted Partition Recovery, Data Recovery Tools, Data Recovery Procedures and Ethics, Preserve and safely handle original media, Document a "Chain of Custody", Complete time line analysis of computer files based on file creation, file modification and file access.	
UNIT V		**10**
	Cyber Security- Introduction to Cyber Security, Implementing Hardware Based Security, Software Based Firewalls, Security Standards, Assessing Threat Levels, Forming an Incident Response Team, Reporting Cyber crime, Operating System Attacks, Application Attacks, Reverse Engineering & Cracking Techniques and Financial Frauds	

TEXT BOOKS:

1. Nelson, B., Phillips, A., Enfinger, F. and Steuart, C., Guide to Computer Forensics and Investigations, Fourth
Edition. Thomson/Course Technology, 2008. 4'th Edition
2. Bernadette H Schell, Clemens Martin, "Cybercrime", ABC – CLIO Inc, California, 2004.
3. "Understanding Forensics in IT ", NIIT Ltd, 2005.

REFERENCES:

1. Kevin Mandia, Chris Prosise, Matt Pepe, "Incident Response and Computer Forensics ", Tata McGraw -Hill, New Delhi, 2006.
2. Robert M Slade," Software Forensics", Tata McGraw - Hill, New Delhi, 2005.
3. Faiyaz Ahmad, "Cyber law and Information Security", Dreamtech, New Delhi, 2013.
http://www.ifs.edu.in/cyber-forensics-cyber-crimes-cyber-security-cyber-law/

CO-PO-PSO Mapping

PO	**PO**											**PSO**			
CO	**PO I**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO 1	2	1	3		1	3	1		1	1	2	**2**	**2**	1	
CO 2	3	2	3		1	1			2		2	**1**	**3**		
CO 3	2	2	1		2	2	3		1		3	1		**3**	
CO 4	3	2	2		3	3					2			**3**	
CO 5	3	1	1		1	2	1				2				**3**
1: Low Association, 2: Average Association, 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Digital image Processing, Subject Code: CS-529
w.e.f. july2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

UNIT I	**Digital Image Fundamentals**: Image Sensing, and Acquisition, Image Sampling and Quantization, Basic Relationshipbetween Pixels. Sensor and Imaging: Imaging Optics, Radiometry of Imaging, illumination sources andtechniques, Camera Principles,Color Imaging,SingleSensorColorImaging andColorDemosaicing,RangeImages,3DImaging.	**8**
UNIT II	SignalRepresentation:VectorSpaceandUnitaryTrasnsforms,Multi-ResolutionalSignalRepresentation,WaveletDecomposition,Scalespaceanddiffusion,Representationofcolor,RetinexProcessing,MarkovRandomFieldModellingsofImages.	**10**
UNIT III	Non-linear Image Processing: Median and Order Statistics Filters, Rank-Ordered-Mean Filtersand Signal DependentRank-Ordered-Mean Filters, TwoDimensional Teager Filters,Applications of nonlinear filters in image enhancement,edge detections, noise removal etc.	**8**
UNIT IV	ImageProcessinginBiometricSecurity:Introduction,FingerprintRecognition,FaceRecognition,IrisRecognition,Vein Pattern Recognition, Multimodal Biometrics Techniques. Biometric System Architeture, Extraction Algorithm,Matching Algorithm, Authentication, Biometric System Evaluation, Privacyissues.	**8**
UNIT V	Image Processing in Medical Field: Introduction, CT scan images, MRI, Seeded segmentation methods : Desirableproperties, Pixel Based Methods, Contour Based Methods,Geodesic Active Contours, level set method, deformablemodel, graph based method, Image analysis of retinal images :acquisition,preprocessing.	**10**

References:

1.R.C Gonzalez and R.E. Woods, " Digital Image Pr ocessing" , Addison Wesley, 1992.
2.A.K.J ain, " Fundamentals of Digital Image Pr ocessing" , Pr entice Hall of India.
3. Digital Image Processing–M. Anji Reddy, BSPublications.

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Applied Data Mining and Warehousing, Subject Code: CS-530
w.e.f –july2016

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

CO 1	Develop a strong foundation of knowledge about data warehouse and related techniques.
CO 2	Design and build a data warehouse from the available historical data and perform OLAP operations to discover knowledge.
CO 3	Preprocess the data using cleaning, integration, transformation and reduction and find associations and correlations among that data.
CO 4	Classify the given dataset by using statistical and probabilistic models to predict the class labels of new data.
CO 5	Perform cluster analysis by using some major clustering methods and work on the recent advancements on text and web mining.

UNIT I	Overview & Concepts- Introduction to Data Warehousing, Data Warehousing Features, Data Warehouses and Data Marts; Difference between Operational Database Systems and Data Warehouses; Data Warehouse Implementation; Multidimensional Data Model, Data Warehouse Implementation, Further Development of Data Cube Technology, Architecture: Understanding Data Warehouse Architecture, Architectural Framework.	8
UNIT II	Technical Architecture: Introduction to Principles of Dimensional Modeling; Data Extraction, Transformation, and Loading, OLAP in the Data Warehouse: Demand for Online Analytical Processing, Major Features and Functions, OLAP Models; From Data Warehousing to Data Mining, Data Preprocessing: Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.	8
UNIT III	Data Mining: Introduction, Data Mining Functionalities, Classification of Data Mining System; Data Mining Primitives, Languages, and System Architectures: Data Mining Primitives, Data Mining Query Languages, Designing Graphical User Interfaces Based on a Data Mining Query Language Architectures of Data Mining Systems Concepts Description: Characterization and Comparison: Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes, Mining Descriptive Statistical Measures in Large Databases.	8

UNIT IV	Mining Association Rules in Large Databases: Association Rule Mining, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, Mining Multidimensional Association Rules from Relational Databases and Data Warehouses Classification and Prediction: Classification by Decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification Based on Concepts from Association Rule Mining	8
UNIT V	Cluster Analysis Introduction: Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis. Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Ser ies and Sequence Data, Mining Text Databases, Mining the World Wide Web	8

REFERENCES :

1. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier.
2. Mallach,"Data Warehousing System",McGraw –Hill.
3. H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education.
4. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education.
5. Data Mining: The Textbook Springer;2015th Edition

Advance Distributed Operating Systems Lab
COURSE CODE: CS 521
COURSE CREDIT: 1

1. Simulate the functioning of Lamport's Logical Clock in"C"
2. Simulate the Distributed Mutual Exclusion in"C".
3. Implement a Distributed Chat Server using TCP Sockets in"C".
4. Implement "Java RMI" mechanism for accessing methods of remotesystems.
5. Implement concurrent client serverapplication.
6. Implement concurrent daytime client serverapplication.
7. Write a program to increment counter in sharedmemory.
8. Design a Distributed Application using RMI for remotecomputation.
9. Design a Distributed Application using Message passing Interface for remote computation.
10. Design a Distributed application using socket. Application consists of a server which takes an integer rvalue from the client, calculates factorial and returns the result to the Client program

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Parallel Algorithm, Subject Code: CS-602
w.e.f.July-2017

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

UNIT-1
Parallelcomputing,massiveparallelprocessing,granularityofparallismComputationaldemands,advantagesofparallelsystems. Flynn s classification, controlled parallelism and scalability. Topologies: Mesh, binary tree, Hyper tree, CubeConnectedcycles,shuffle-ConnectedExchange; [8]

UNIT2
UniformMemoryAccess(UMA&NonuniformMemoryAccess(NUMA)MultiprocessorSystem.PARAMModelofParallelComputation,PARAMAlgorithms;ParallelReductions,Prefixsum,ListRanking,MergingofTwoSortedList. [8]

UNIT3
Mapping and Scheduling; mapping of Data from Topology to other (Ring to 2-D Mesh, Binomial trees to 2-D mesh,Rings & mesh into 2-D Mesh, Ring & Mesh into Hypercube), Load balancing, Static scheduling on UMA multi-processorsystems. [9]

UNIT4
Applications of parallel computing: Matrix Multiplication, Sorting (bitonic Merge sort, parallel quick sort, hyper quicksort),SearchingaGraph(P-depthsearch,Breadth-DepthSearch,Breathfirstsearch). [9]

UNIT5
Parallel Branch and bound algorithms. Graph algorithms, minimum cost spanning tree, single source shortest paths, allpair's shortest paths, and algorithms for sparse graphs. Mapping matrices on processors, matrix transposition, matrixvectormultiplication,andmatrixmultiplication,solvingsystemsoflinearequations. [9]

REFERENCES:

1. MichelJ.Quinn,ParallelComputing:TheoryandPractice,McGraw-Hill
2. KaiHwang,AdvancedComputerArchitecture,McGraw-Hill.

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Ad-hoc Sensor Network, Subject Code: CS-603
w.e.fSession2017

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

UNIT I	**Introduction of ad-hoc/sensor networks** Key definitions of ad-hoc/sensor networks, Advantages of ad-hoc/sensor networks, Unique constraints and characteristics of MANET, challenges & Performance parameters of Adhoc networks, Types & Applications of MANETs, Introduction of sensor network, sensor networks vs. ad-hoc networks, sensor network limitations, Design issues.	**8**
UNIT II	**Routing in Ad Hoc Networks** Introduction, Topology based routing protocol- Proactive routing- DSDV, WRP, TBRPF, OLSR, multipoint relay, STAR, Reactive routing- DSR, AODV, TORA, Hybrid routing approach- ZRP, FSR, LANMAR, CBRP, Position based routing- Location services- DREAM, quorum based location service, GLS, home zone, forwarding strategies- greedy packet forwording, Restricted Directional flooding- DREAM, LAR, RDMAR , Hierarchical routing, Other position based routing protocols.	**10**
UNIT III	**Wireless sensor networks** Design Issues, Challenges of Wireless sensor network, Energy consumption, Clustering of sensors- regularly placed sensor, randomly distributed sensors, Heterogeneous WSNs. Mobile Sensors, attacks on sensor network routing- Spoofed, altered, or replayed routing information, selective forwarding, sinkhole attacks, the Sybil attack, Wormholes, HELLO flood attacks, Acknowledgement spoofing, application of sensor networks.	**8**
UNIT IV	**Data retrieval in sensor networks** Introduction, Classification of WSNs- Architecture of sensor networks, network architecture, Routing Layer- Network structure based- flat routing- Directed diffusion, sequential assignment routing, MCFA, coherent and non-coherent processing, energy aware routing, Hierarchical routing- CBRP, LEACH, PEGASIS, MECN, TEEN, APTEEN, routing in fixed size clusters, sensor aggregates routing, Hierarchical power- Aware routing, flat versus Hierarchical.	**8**
UNIT V	**Security** Introduction, distributed system security, security in Ad- Hoc networks- requirements, security solutions constraints, challenges. Key Management- background, Diffie- Hellman key agreement, N- Party Diffie-Hellman Key agreement, The tree based generalized Diffie-Hellman protocol, Cooperation in MANETS, WSN security, Key distribution and management, Requirements for bootstrapping security in sensor networks, key distribution techniques in sensor networks- using a single network-wide key, using pair wise-shared keys, random key pre-distribution scheme, security protocols for sensor network, general consideration of using public key method, SPINS: SNEP AND µTELSA.	**10**

References:

1. AD HOC & SENSOR NETWORK "Theory and Application" by Carlos de MoraisCordeiro, World scientific press.
2. "Wireless Ad Hoc and Sensor Networks" by HoudaLabiod , Willy Publication

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Agile Software Engineering Subject Code: CS-605
w.e.fSession2017

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

UNIT I	Why Agile? Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility, How to Be Agile? Agile Methods Don't Make Your Own Method, The Road to Mastery, Find a Mentor.	**8**
UNIT II	UnderstandingXP:TheXPLifecycle,TheXPTeam,XPConcepts,AdoptingXP:IsXPRightforUs?Go!,AssessYour Agility.	**8**
UNIT III	Practicing XP: Thinking: Pair Programming, Energized Work, Informative Workspace, Root-Cause Analysis, Retrospectives, Collaborating: Trust, Sit Together, Real Customer Involvement, Ubiquitous Language, Stand Up Meetings, Coding Standards, Iteration Demo, Reporting, Releasing:"DoneDone", No Bugs, Version Control, Ten-MinuteBuild,ContinuousIntegration,CollectiveCodeOwnership,Documentation,Planning:Vision,ReleasePlanning, The Planning Game, Risk Management, Iteration Planning, Slack, Stories, Estimating, Developing: Incremental Requirements, Customer Tests, Test-Driven Development, Refactoring, Simple Design, Incremental Design and Architecture,SpikeSolutions,PerformanceOptimization,ExploratoryTesting.10hours.	**8**
UNIT IV	Mastering Agility: Values and Principles: Commonalities, About Values, Principles, and Practices, Further Reading, Improve the Process: Understand Your Project, Tune and Adapt, Break the Rules, Rely on People: Build Effective Relationships, Let the Right People Do the Right Things, Build the Process for the People, Eliminate Waste: Work in Small,ReversibleSteps,FailFast,MaximizeWorkNotDone,PursueThroughput.	**8**
UNIT V	Deliver Value: Exploit Your Agility, Only Releasable Code Has Value, Deliver Business Results, Deliver Frequently, Seek Technical Excellence: Software Doesn't Exist, Design Is for Understanding, Design Tradeoffs, Quality with a Name, Great Design, Universal Design Principles, Principles in Practice, Pursue Mastery. Text: 1. The Art of Agile Development (Pragmatic guide to agile software development), James shore, Chromatic, O'ReillyMedia,ShroffPublishers&Distributors,2007.	**8**

References:

1. AgileSoftwareDevelopment,Principles,Patterns,andPractices,RobertC.Martin,PrenticeHall;1stedition,2002
2. "AgileandIterativeDevelopmentAManger'sGuide",CraigLarmanPearsonEducation,FirstEdition,India,2004.

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Advance Cloud Computing Subject Code: CS-606
w.e.f Session2017

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

CO 1	Apply his knowledge to develop a cloud environment using hardware and software virtualization techniques and perform Map Reduce job execution
CO 2	Use common cloud services and components of Hadoop ecosystem in order to solve a real world problem.
CO 3	Utilize the SOA and MVC techniques, classify and cluster Big Data and able to develop a recommendation system
CO 4	Develop highly secured and high performance cloud applications.
CO 5	Develop a research attitude in emerging fields of cloud computing and write Quality research papers.

Objective:

UNIT I	**Introduction to Cloud Computing :**Definition(s) of Cloud Computing, Characteristics of Cloud, Cloud Deployment Models, Cloud Service Models, Driving Factors and Challenges of Cloud and Overview of Applications of Cloud. **Cloud Concepts & Technologies:** Virtualization, Load Balancing, Scalability & Elasticity, Deployment, Replication, Monitoring, MapReduce, Identity and Access Management, Service Level Agreements and Billing.	**8**
UNIT II	**Cloud Services and Platforms :**various types of cloud services including compute, storage, database, application, analytics, network and deployment services. **Hadoop & MapReduce:** Overview of Hadoop echo system, MapReduce architecture, MapReduce job execution flow and MapReduce schedulers.	**8**
UNIT III	**Cloud Application Design:** cloud application design considerations, cloud application reference architectures, design methodologies such as SOA, CCM and MVC, data storage technologies and cloud deployment approaches. **Big-Data Analytics:** big data analytics approaches: approaches for clustering big data, approaches for classification of big data and recommendation systems.	**8**
UNIT IV	**Cloud Security:** Cloud security challenges, approaches for authorization authentication, identify & access management, data security, data integrity encryption & key management. **Cloud Application Benchmarking & Tuning:** cloud application workload characteristics, performance metrics for cloud applications, cloud application testing, performance testing tools and a load test and bottleneck detection case study.	**8**
UNIT V	**Cloud Computing Case-Studies:** Review of Technical papers from Major journals (IEEE Transactions) and major conferences (IEEE / Springer etc.) on Cloud Computing / Software Engineering / Other Thrust Areas and Presentations by Students on their understanding of the same, after reviewing the papers concerned.	**8**

References:

3. CloudComputingAHands-onApproachbyA.Bagha&V.Madisetti[ISBN:978-81-7371-923-3]Published by University Press, pp. 456, Printed in2014.

CO-PO/PSO MAPPING

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO															

CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
1: Low Association, 2: Average Association, 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: System Simulation and Modeling Subject Code: CS-607
w.e.fSession2017

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

UNIT I	Systems, Modelling, Simulation. Simulation as a tool, Advantages and Disadvantages of Simulation, Areas of Application, Classification of simulation models, continuous simulation, combined continuous- discreet simulation, Discrete-Event System Simulation, Monte Carlo Simulation. Steps of Simulation Study.	**8**
UNIT II	Introduction to Modeling, Modeling Concepts and Definitions. Model of a System, Types of Models. Linear models, Nonlinear Functions Quadratic program model, Nonlinear modeling examples, Unconstrained and constrained growth models, Curve fitting, Stochastic models. Modelling complex system. Accuracy and precision in modelling.	**8**
UNIT III	Basic Probability and statistics: Random Variables, Properties of Random Numbers, Generation of Pseudo- Random Numbers. Techniques for Generating Random Numbers. Tests for Random Numbers. Stochastic Processes. Means, Variances and Correlations. Probability Distribution. Confidence intervals and hypothesis test.	**8**
UNIT IV	Types of Simulations with Respect to Output Analysis .Stochastic Nature of Output Data. Measures of Performance and Their Estimation. Output Analysis for Terminating Simulations, Output Analysis for Steady-State Simulations. Simulation Tools, Model Input. High-Level Computer- System Simulation, CPU Simulation, Memory Simulation.	**8**
UNIT V	Verification and Validation: Verification of Simulation Models, Calibration and Validation of Models. Increasing Model Validity and Credibility. Simulation Softwares: Simulation package vs programming languages, classification, features, General purpose simulation package, object oriented simulation, application. Overview of commonly used simulation systems.	**8**

References:

1. Averill M. Law, W. David Kelton, "Simulation Modelling and Analysis" Third Edition, McGrawHill.
2. Jerry Banks, John S. Carson, Barry L. Nelson, David M. Nicol, "Discrete- Event System Simulation", Third Edition, Prentice-HallIndia
3. Geoffrey Gordon, "System Simulation", Second Edition, Prentice-HallIndia.

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Advance Mobile Computing Subject Code: CS-608
w.e.fSession2017

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

UNIT I		**8**
	Introduction to Wireless Communication: Application, Frequencies for radio transmission, Signals, Antennas, Signal propagation,Path loss of radio signals, additional signal propogation effects, Multi path propogation. Multiplexing: Space division multiplexing, Frequency division multiplexing, Time division multiplexing, Code division multiplexing, Modulation: Amplitude shift keying, Frequency shift keying, Phase shift keying. Spread spectrum: Direct sequence spread spectrum, Frequency hopping spread spectrum, Cellular systems.	
UNIT II		**8**
	Channel Allocation: Motivation for a specialized MAC, Hidden and exposed terminals, Near and far terminals, SDMA, FDMA, TDMA, Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Multiple access with collision avoidance. Code division multiple access.	
UNIT III		**8**
	Telecommunications systems: GSM: Mobile services, System architecture, Radio sub system, Network sub system, Operation subsystem. Radio interface, Logical channel and frame hierarchy. Localization and calling: MOC and MTC, Handover, Security: Authentication, Encryption. General Packet Radio Service (GPRS) Satellite systems: History, Applications, Basics of GEO, LEO and MEO, Routing, Localization, Handover.	
UNIT IV		**8**
	Wireless LAN: Advantages and disadvantages of WLAN. Infrared vs radio transmission, Infrastructure and ad- hoc network, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer: DFWMAC-DCF using CSMA/CA, DFWMAC-DCF with RTS/CTS. MAC management: Synchronization, Power management, roaming. Bluetooth: User scenarios, Architecture. WiMAX: Layer Architecture.	
UNIT V		**8**
	Mobile network layer: Mobile IP: Goals, assumptions and requirements, Entities and terminology, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Optimizations, Reverse tunneling, IPv6, Dynamic host configuration protocol. Mobile Adhoc network: architecture, Distance vector routing, Adhoc on- demand distance vector routing and dynamic source routing.Security Issuues in mobile computing: Introduction, Information Security, Security Techniques, Security Protocols, Public key Infrastructure.	

References:

1. Jochen Schiller, " Mobile Communications, Pearson Education, 2nd Edition, 2003.
2. Dharma Prakash Agrawal & Qing-An Zeng " Introduction to Wireless & Mobile Systems", Thomson Brooks/Cole, 2nd Edition 2003.
3. Krzysztof Wesolowski, "Mobile Communication Systems ", John Wiley & Sons, Ltd.
4. Ron Olexa, "Implementing 802.11, 802.16 and 802.20 Wireless Networks, Elsevier
5. Ashok Talukdar, "Mobile Computing". Tata Mcgraw Hill Publication.

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Big Data, Subject Code: CS-609
w.e.f Session 2020-21

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

CO1	Student must be Able to understand the building blocks of Big Data
CO2	Student must be able to articulate the programming aspects of cloud computing(map Reduce etc)
CO3	Student must be able to understand the specialized aspects of big data with the help of different big data applications
CO4	Student must be able to represent the analytical aspects of Big Data
CO5	Student must be know the recent research trends related to Hadoop File System, MapReduce and Google File System etc

Objective:

1.To study the basic technologies that forms the foundations of Big Data.

2.To study the programming aspects of cloud computing with a view to rapid prototyping of complex applications.

3.To understand the specialized aspects of big data including big data application, and big data analytics.

4.To study different types Case studies on the current research and applications of the Hadoop and big data in industry

UNIT I	**Data structures in Java** **Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters,** **Implementing Generic Types, Generic Methods, Wrapper Classes, Concept ofSerialization.**	**8**
UNIT II	**Working with Big Data** **Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop(Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local,Pseudo-distributed mode, Fully Distributed mode), Configuring XML files**	**8**
UNIT III	**Writing MapReduce Programs** **Understanding Hadoop API for MapReduce Framework, Basic programs of Hadoop** **MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner**	**8**
UNIT IV	**Hadoop I/O** **The Writable Interface, WritableComparable and comparators, Writable Classes: Writablewrappers for** **Java primitives, Text, BytesWritable, NullWritable, ObjectWritable and GenericWritable, Writable collections,** **Implementing a Custom Writable: Implementing a RawComparator for speed, Custom comparators**	**8**
UNIT V	Pig and hive Pig Architecture, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces. Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.	**8**

References:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC

2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly, Hadoop in Action byChuck Lam, MANNING Publ.

3. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly Hadoop for Dummies by Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss

CO-PO/PSO MAPPING

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	–	–	–	–	–	–	–	–	2	2
CO2	2	2	1	1	1	–	–	–	–	–	–	–	–	2	2
CO3	2	2	1	2	1	–	–	–	–	–	–	–	–	2	2
CO4	2	2	1	2	1	–	–	–	–	–	–	–	–	2	2
CO5	2	2	2	3	2	–	–	–	–	–	–	–	–	2	2
1: Low Association, 2: Average Association, 3: Strong Association															

Integral University, Lucknow
Department of Computer Science & Engineering
M.TECH. COMPUTER SCIENCE AND ENGINEERING
Subject Name: Advance Web Technology Subject Code: CS-610
w.e.fSession2017

Pre-requisite	Co-requisite	L	T	P	C
None	None	4	0	0	4

UNIT I		**8**
	Introduction to DHTML ,DHTML and Style-Sheet ,An overview of JavaScript ,writing JavaScript code, Variables Data types and operators in JavaScript ,Conditional Statement and looping Construct in JavaScript ,Built-in objects, Functions in JavaScript, Document object Model, Event handling and cookies.	
UNIT II		**8**
	Introduction, Syntax, Inclusion, Measurement Units, Colors, Backgrounds, Fonts, Text, Images, Links, Tables, Borders, Margins, Lists, Padding, Cursors Outlines, Dimension, Scrollbars, Visibility ,Positioning, Layers ,Pseudo classes, Pseudo Elements, Text Effects, Rules ,Layout and Validations.	
UNIT III		**8**
	Introduction of XML,Syntax,Documents,Declaration,Tags,Elements,Attributes,Comments, Character Entities, CDATA Sections, White spaces, Processing, Encoding, Validations, DTD, Schemas,Treestructure,DOM,Namespaces,Databases,XMLTools(Viewers,Editors,Parsers, processors)	
UNIT IV		**8**
	Introduction of PHP, Commonusesof PHP,CharacteristicsofPHP,"HelloWorld"ScriptinPHPEnvironmentSetup,SyntaxOverview, Variables,Constants,Operators,DecisionMaking,LoopArrays,String,Webconcept,GET& POST,Fileinclusion.	
UNIT V		**8**
	Files & I/O, Functions, cookies, sessions, sending emails, File Uploading, Predefined Variables, Regular Expressions, Error Handing ,Bug debugging ,Date & Time, PHP &AJAX,PHP & MySQL and PHP &XML	

References:

1. Dynamic HTML: The Definitive Reference By Danny Goodman
2. CSS: The Definitive Guide, 3rd Edition, By Eric A. Meyer,Publisher: O'Reilly Media
3. XML & Related Technologies by AtulKahate, Pearson Education India

PROGRAMMING LAB
COURSE CODE: CS611
COURSE CREDIT: 4

COURSE OBJECTIVES:

- To learn the basic concepts and syntax of Python programming.
- To be able to develop logics which help them to create programs and applications using Python language.
- To learn the use of Python library functions in Python language.
- Learn to develop various graphical applications in Python language.
- After learning the Python programming they can easily switch over to any other language.

COURSE OUTCOMES (CO):

After completion of the course, a student will be

CO 1	Able to understand the basic concepts of Python programming language and their implementation.
CO 2	Able to design and develop various programming problems using Python programming concepts.
CO 3	Able to analyze and develop programs of varying complexity.
CO 4	Able to develop programs on different operations on arrays, matrices & strings.
CO 5	Able to develop programs for graphical applications.

Lab1:Preliminaries.
–Objective:Understandtheinterpretednatureof Python:
Appreciate the factThat to a large extent,Pythonallowsa"natural"style ofprogramming.Carry outsimple tasks usingthePythoninterpretercommandline.
–
ConstructsIntroduced:basicdatatypes(string,int,floatetc.),largeintegersinPython,collections(lists)andassociativelistsandoperationsonthese;variables,assignment,operators,expressions;basicI/O;numericalcomputationsusingthePythonmathlibrary.Creating andrunningPython
sourcefiles(.py).
–ClassExercises:Basicexercisesonalltheabove.
–Take Home Exercises: Output 3-letter month name given the month number using strings; Convert a date in the d/m/yformat (d, m andy are day month andyear respectively as numbers) to a given(fixed)format; Take the principal amountandthetermofaloanandprinttheEMI.

Lab2:ControlStructures(LoopsandConditionals)andFunctions.
–Objective:Usecontrolstructures to direct the"flow"of computation.Get abasicunderstanding of modularizationusingfunctionsanditsroleindealingwithcomplexity,maintainabilityandreadabilityofprograms.
–Constructs Introduced: if-then-else; while- and for-loops; Iterators on lists. Conditional expressions; Functions and theirarguments.Basicobjectorienteddot(.)notation.
–ClassExercises:Pictorialnumbers.Convertanumberinwordstonumeric.RandomNumberGenerator.
–TakeHomeExercises:Binary Search;Simulate aqueue;Find the averageof all the input numbers untilaprompt;Invertastring;FindthesquarerootofanumberusingNewtonsmethodwheretheiterativeformulaisgiven;Generalizationof the pictorial numbers exercise; Convert romannumerals to decimal andvice versa;Answersimplequestions with a fixed structure (e.g.Is the dolphin a mammal?) using an associative list as a "database" of animals withtheirclassification.

Labs3,4:MoreExercisesonLoops&Functions.Recursion.
–Objective:Getcomfortablewiththe idea thatfunctions cancall themselves.More involvedexercises using loops,functionsandrecursion.
–ConstructsIntroduced:Useofrandom.pymodule.Command-linearguments.
–ClassExercises:Quicksort.Miller-RabinPrimalityTest.
–TakeHomeExercises:CompletetheQuicksortandMiller-RabinPrimalityTest;SolvetheKoenigsburgProblemongraphs;Writeadecoderforatextthathasbeenencryptedusing aCaesarcypher.

Labs5,6:ObjectOrientation &GUIUsingPython.
–Objective:AnelementaryfamiliaritywithOOnotions.Abilitytocreateandworkwithsimple GUIsandgraphics.
–ConstructsIntroduced:Classes,wxPythonlibraryandsomegraphicslibrarylikeVPython.
–ClassExercises:Geometricshapesandsomesimpleprimitives.Convexhull.

–TakeHomeExercises:Operationsonsparsematrices

Labs 7,8:Installingand workingwithLatex

Labs9,10: Conceptof insertingtable,arrays,contents,referencesinaresearchpaperusingLatex

CO-PO MAPPING:

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**1**	**1**	**2**		**3**		**3**						**2**	**1**	**1**
CO2	**1**	**1**	**1**	**2**	**1**		**3**						**2**	**1**	**1**
CO3	**1**	**2**	**2**	**2**			**3**						**2**	**1**	**1**
CO4	**1**	**2**	**2**	**2**			**3**						**2**	**1**	**1**
CO5	**1**	**2**	**1**				**3**						**2**	**1**	**1**
1: Low Association, 2: Average Association, 3: Strong Association															

SIMULATION TOOLS LAB
COURSE CODE: CS612
COURSE CREDIT: 4

Experiments based on SCILAB

STUDY OF BASIC SCI LAB COMMANDS

OBJECTIVE: Practicing SCI LAB environment with simple exercises to familiarize CommandWindow, History, Workspace, Current Directory, Figure window, Edit window, Shortcuts, Helpfiles.

MATRIXCONSTRUCTORSANDOPERATIONSZeros(m,n) – creates m rows with n colsEye(m,n) –createsidentitymatrix Ones(m,n)– createsmatrix withall1'sforall mrowsandncolsrand(m,n) –createsmatrixwithrandomnumbers Max(z)andMin(z)--returnsthelargest andsmallestelement inavector.prod(z) – returnstheproductofallelementsinavector.
MATRIXBITWISE,RELATIONAL&LOGICALOPERATIONS

OBJECTIVE: Thestudyon
Relationaloperations
(Relationaloperators:<<=>>===~=)
logical operations *a=0;b=10;ifaandb*
disp("Condition is true");else
disp("Conditionisfalse");
end

bitwiseoperations

U=[001101];
V=[011001];
>>U|V

CONTROL STRUCTURES(If-Else, If-elseif–else, Select)

Tofindwhetheranumberisanevennumberornot

To printonwhatdaywe areinaweek

Todeterminewhetheranumberis+veor–veorzero

CONTROLSTRUCTURES(for,while, breakandcontinue)

Tofind factorialofgivennumber usingforloop

Tofindfactorialofgivennumberusingwhileloop

To find sum of all positive numbers entered by user (enter '0' to terminate) using breakandcontinue
GRAPHICS2DPLOTS

Plotting a single plot on the graphMultipleplots onthesamegraph
SCILAB–ComputerAPPLICATIONPROGRAM(1)

WriteaprograminScilabforEdgeDetectionusingDifferentEdgedetectors[1].Sobel[2].Prewitt [3].Log[4].Canny

ExperimentsbasedonNetworksimulator(NS-2)
8.

Tclscripttocreatefixedwirelessnodes.
Tclscript tocreatefixedcolorwirelessnodes.

9.

(a).Tclscripttocreatethedynamicnumberofnodes .
(b).Tclscripttocreatethedynamicnumberofnodes andits initiallocation.

Tclscripttocreatethedynamiccolorandinitiallocationtonodes.
Tclscripttogivemobilitytonodes
TclscripttomakeTCPcommunicationbetweennodes